Psychology

Textbook for Class XI

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CONTENTS

	Page
Note for the Teachers	*ix*
Note for the Students	xi
Chapter 1 What is Psychology?	1
Chapter 2 Methods of Enquiry in Psychology	22
Chapter 3 The Bases of Human Behaviour	43
Chapter 4 Human Development	64
Chapter 5 Sensory, Attentional and Perceptual Processes	84
Chapter 6 Learning	107
Chapter 7 Human Memory	131
Chapter 8 Thinking	149
Chapter 9 Motivation and Emotion	169
Glossary	188
Suggested Readings	198

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Chapter 1

What is Psychology?

After reading this chapter, you would be able to

- understand the nature and role of psychology in understanding mind and behaviour,
- state the growth of the discipline,
- know the different fields of psychology, its relationship with other disciplines, and professions, and
- appreciate the value of psychology in daily life to help you understand yourself and others better.

The growth of the human mind is still high adventure, in many ways the highest adventure on earth.

– Norman Cousins

Contents

Introduction
What is Psychology?
- Psychology as a Discipline
- Psychology as a Natural Science
- Psychology as a Social Science

Understanding Mind and Behaviour
Popular Notions about the Discipline of Psychology
Evolution of Psychology
- *Some Interesting Landmarks in the Evolution of Modern Psychology* (Box 1.1)

Development of Psychology in India
Branches of Psychology
Themes of Research and Applications
Psychology and Other Disciplines
Psychologists at Work
Psychology in Everyday Life

Key Terms
Summary
Review Questions
Project Ideas

Introduction

You were, perhaps, asked by your teacher in the first class why you opted for psychology over other subjects. What do you hope to learn? If you were asked this question, what was your response? Generally, the range of responses which surface in class to this question are truly bewildering. Most students give inane responses, like they want to know what others are thinking. But then one also comes across such responses as knowing oneself, knowing others or more specific responses like knowing why people dream, why people go out of their way to help others or beat each other up. All ancient traditions have engaged themselves with questions about human nature. The Indian philosophical traditions, in particular, deal with questions relating to why people behave in the manner in which they do. Why are people generally unhappy? What changes should they bring about in themselves if they desire happiness in their lives? Like all knowledge, psychological knowledge too is intended to contribute to human well-being. If the world is full of misery, it is largely due to humans themselves. Perhaps, you have asked why a 9/11 or war in Iraq happened. Why innocent people in Delhi, Mumbai, Srinagar or in the North-East have to face bombs and bullets? Psychologists ask what is in the experiences of young men which turn them into terrorists seeking revenge. But there is another side to human nature. You may have heard the name of Major HPS Ahluwalia, paralysed waist down because of an injury he suffered in a war with Pakistan, who climbed the Mt. Everest. What moved him to climb such heights? These are not only questions about human nature which psychology addresses as a human science. You will be surprised to learn that modern psychology also deals with somewhat nebulous micro-level phenomenon like consciousness, focusing attention in the face of noise, or supporters trying to burn down a shopping complex after their team had scored victory in a football game over its traditional rival. Psychology cannot claim that answers have been found to these complex questions. But it surely has improved upon our understanding and how we make sense of these phenomena. The most striking aspect of the discipline, unlike other sciences, lies in the study of psychological processes which are largely internal and available to humans for observation within themselves.

What is Psychology?

Any knowledge discipline is hard to define. Firstly, because it evolves continuously. Secondly, because the range of phenomena it studies cannot be captured by any one definition. This is even more true of psychology. Long time back, students like yourself were told that the term psychology is derived from two Greek words *psyche* meaning soul and *logos* meaning science or study of a subject. Thus, psychology was a study of the soul or mind. But since then it has moved away considerably from this focus and established itself as a scientific discipline which deals with processes underlying human experience and behaviour. The range of phenomena it studies, some of which we mentioned above, are spread over several levels, viz. individual, dyadic (two person) group, and organisational. They also have biological as well as social bases. Naturally, therefore, the methods required to

study them also vary greatly depending on the phenomenon one wants to study. A discipline is defined both in terms of what it studies and how it studies. In fact, more in terms of how or method/s it uses. Keeping this in view, *psychology is defined formally as a science which studies mental processes, experiences and behaviour in different contexts*. In doing so, it uses methods of biological and social sciences to obtain data systematically. It makes sense of these data so that they can be organised as knowledge. Let us try to understand the three terms used in the definition, namely, mental processes, experience, and behaviour.

When we say experiences are internal to the experiencing person, then we refer to states of consciousness or awareness or **mental processes**. We use our mental processes when we think or try to solve a problem, to know or remember something. One level at which these mental processes are reflected is the brain activity. As we think or solve a mathematical problem, our brain activities can be observed using different techniques of brain imaging. However, we cannot say that brain activities and mental processes are the same, although they are interdependent. Mental activities and neural activities are mutually overlapping processes but, they are not identical. Unlike the brain, the mind does not have a physical structure or has a location. Mind emerges and evolves as our interactions and experiences in this world get dynamically organised in the form of a system which is responsible for the occurrence of various mental processes. Brain activities provide important clues as to how our mind functions. But the consciousness of our own experiences and mental processes are much more than the neural or brain activities. Even when we are asleep some mental activities go on. We dream, and receive some information such as a knock on the door while we are asleep. Some psychologists have shown that we also learn and remember in our sleep. Mental processes, such as remembering, learning, knowing, perceiving, feeling are of interest to psychologists. They study these processes to try to understand how the mind works and to help us improve the uses and applications of these mental capacities.

Psychologists also study **experiences** of people. Experiences are subjective in nature. We cannot directly observe or know someone else's experience. Only the experiencing person can be aware or be conscious of her or his experiences. Thus, experiences are embedded in our awareness or consciousness. Psychologists have focused on experiences of pain being experienced by terminally ill patients or of psychological pain felt in bereavement, besides experiences which lead to positive feelings, such as in romantic encounters. There are some esoteric experiences also which attract the attention of psychologists, such as when a Yogi meditates to enter a different level of consciousness and creates a new kind of experience or when a drug addict takes a particular kind of drug to get a high, even though such drugs are extremely harmful. Experiences are influenced by internal and the external conditions of the experiencer. If you are travelling in a crowded bus during a hot summer day, you may not experience the usual discomfort if you are going for a picnic with some close friends. Thus, the nature of experience can only be understood by analysing a complex set of internal and external conditions.

Behaviours are responses or reactions we make or activities we engage in. When something is hurled at you, your eyes blink in a simple reflex action. You are taking an examination and can feel your heart pounding. You decide to go for a particular movie with a friend. Behaviours may be simple or complex, short or enduring. Some behaviours are overt. They can be outwardly seen or sensed by an observer. Some are internal or covert. When you are in a difficult situation while playing a game of chess you almost feel your hand muscles twitching, trying to experiment with a move. All behaviours, covert or overt, are associated with or triggered by some stimulus in the environment or changes that happen internally. You may see a tiger and run or think that there is a tiger and decide to flee. Some

psychologists study behaviour as an association between stimulus (S) and response (R). Both stimulus and response can be internal or external.

Psychology as a Discipline

As we have discussed above, psychology studies behaviour, experience and mental processes. It seeks to understand and explain how the mind works and how different mental processes result in different behaviours. When we observe others as lay or common persons, our own points of view or our ways of understanding the world influence our interpretations of their behaviours and experiences. Psychologists try to minimise such biases in their explanations of behaviour and experience in various ways. Some do so by seeking to make their analysis scientific and objective. Others seek to explain behaviour from the point of view of the experiencing persons because they think that subjectivity is a necessary aspect of human experience. In the Indian tradition, self-reflection and analysis of our conscious experiences, is held to be a major source of psychological understanding. Many western psychologists have also begun to emphasise the role of self-reflection and self-knowledge in understanding human behaviour and experience. Regardless of the differences in the way psychologists go about the study of behaviour, mental processes and experiences, they seek to understand and explain them in a systematic and verifiable manner.

Psychology, though it is a very old knowledge discipline, is a young science, if one were to take the year of the founding of the first laboratory of psychology in 1879 in Leipzig. However, what kind of science is psychology, still remains a matter of debate, particularly because of the new interfaces of it that have emerged in recent times. Psychology is generally categorised as a social science. But it should not come to you as a surprise that, not only in other countries, but in India also, it is also a subject of study offered in the faculty of science, both at the undergraduate and post-graduate levels. Many students go on to earn a B.Sc. or M.Sc. degree in universities. In fact, two of the most sought after emerging disciplines which continuously borrow from psychology are Neuroscience and Computer Science. Some of us would be aware of the fast developing brain imaging techniques like fMRI, EEG, etc. which make it possible to study brain processes in real time, i.e. when they are actually taking place. Similarly, in IT areas, both human-computer interaction and artificial intelligence cannot possibly grow without psychological knowledge in cognitive processes. Thus, psychology as a discipline today has two parallel streams. One which makes use of the method in physical and biological sciences and the other which makes use of the method of social and cultural sciences in studying various psychological and social phenomena. These streams sometimes converge only to drift apart and go their separate ways. In the first case, psychology considers itself as a discipline, which focuses largely on biological principles to explain human behaviour. It assumes that all behavioural phenomena have causes which can be discovered if we can collect data systematically under controlled conditions. Here the aim of the researcher is to know the cause and effect relationship so that a prediction of the behavioural phenomenon can be made and behaviour can be controlled if need be. On the other hand, psychology as a social science focuses on how behavioural phenomena can be explained in terms of the interaction that takes place between the person and the socio-cultural context of which s/he is a part. Each behavioural phenomenon is assumed to have multiple causes. Let us now discuss these two streams separately.

Psychology as a Natural Science

It has been mentioned earlier that psychology has its roots in philosophy. However, modern psychology has developed because of the application of the scientific method to study psychological phenomenon. Science places a great deal of emphasis on objectivity which can be obtained if there is consensus on the definition of a concept and how it can be

measured. Psychology was influenced by Descartes and later on by the developments in physics has grown by following what is called a hypothetico-deductive model. The model suggests that scientific advancement can take place if you have a theory to explain a phenomenon. For example, physicists have what is called a Big-bang theory to explain how the universe came to be formed. Theory is nothing else but a set of statements about how a certain complex phenomenon can be explained with the help of propositions which are interrelated. Based on a theory, scientists deduce or propose a hypothesis, that offers a tentative explanation of how a certain phenomenon takes place. The hypothesis then is tested and proved true or false based on empirical data that one has gathered. The theory is revised if data gathered point in a different direction than the one suggested by the hypothesis. Using the above approach psychologists have developed theories of learning, memory, attention, perception, motivation and emotion, etc. and have made significant progress. Till date, most of the research in psychology follows this approach. Apart from this, psychologists have also been considerably influenced by the evolutionary approach which is dominant in biological sciences. This approach has also been used to explain diverse kinds of psychological phenomenon such as attachment and aggression to mention just a few.

Psychology as a Social Science

We mentioned above that psychology is recognised more as a social science because it studies the behaviour of human beings in their socio-cultural contexts. Humans are not only influenced by their socio-cultural contexts, they also create them. Psychology as a social science discipline focuses on humans as social beings. Consider the following story of Ranjita and Shabnam.

Ranjita and Shabnam were in the same class. Although, they were in the same class, they were just acquainted with each other and their lives were quite different. Ranjita came from a farmer's family. Her grandparents, parents and elder brother worked on their farm. They lived together in their house in the village. Ranjita was a good athlete and was the best long distance runner in the school. She loved meeting people and making friends.

Unlike her, Shabnam lived with her mother in the same village. Her father worked in an office in a town nearby and came home during holidays. Shabnam was a good artist and loved staying home and taking care of her younger brother. She was shy and avoided meeting people.

Last year there was very heavy rain and the river nearby overflowed into the village. Many houses in the low lying areas were flooded. The villagers got together and organised help and gave shelter to people in distress. Shabnam's house was also flooded and she came to live in Ranjita's house with her mother and brother. Ranjita was happy helping the family and making them feel comfortable in her house. When the flood water receded, Ranjita's mother and grandmother helped Shabnam's mother to set-up their house. The two families became very close. Ranjita and Shabnam also became very good friends.

In this case of Ranjita and Shabnam, both are very different persons. They grew up in different families under complex social and cultural conditions. You can see some regularity in the relationship of their nature, experience and mental processes with their social and physical environment. But at the same time, there are variations in their behaviours and experiences which would be difficult to predict using the known psychological principles. One can understand why and how individuals in communities become quite helpful and self-sacrificing in crisis as was the case with the people in the village of Ranjita and Shabnam. But, even in that case, not every villager was equally helpful and also under similar circumstances not every community is so forthcoming; in fact, sometimes, the opposite is true – people become antisocial under similar circumstances indulging in looting and

exploitation when some crisis occurs. This shows that psychology deals with human behaviour and experience in the context of their society and culture. Thus, psychology is a social science with focus on the individuals and communities in relation to their socio-cultural and physical environment.

Understanding Mind and Behaviour

You will recall that psychology was once defined as a science of the mind. For many decades, the mind remained a taboo in psychology because it could not be defined in concrete behavioural terms or its location could not be indicated. If the term "mind" has returned to psychology, we should thank neuroscientists like Sperry and physicists like Penrose, who have given it the respect which it deserved and now has. There are scientists in various disciplines including psychology, who think that a unified theory of the mind is a possibility, although it still is far away.

What is mind? Is it the same as brain? It is true that mind cannot exist without brain, but mind is a separate entity. This can be appreciated on account of several interesting cases that have been documented. Some patients whose occipital lobes, which are responsible for vision, were surgically removed have been found to be responding correctly to location and configuration of visual cues. Similarly, an amateur athlete lost his arm in a motorcycle accident but continued to feel an "arm" and also continued to feel its movements. When offered coffee, his "phantom arm" reached out to the coffee cup and when someone pulled it away, he protested. There are other similar cases documented by neuroscientists. A young man who suffered brain injury in an accident, after he returned home from the hospital, claimed that his parents had been replaced by their "duplicates". They were imposters. In each of these cases, the person had suffered from damage of some part of the brain but his "mind" had remained intact. It was earlier believed by scientists that there is no relationship between the mind and the body and that they were parallel to each other. Recent studies in affective neuroscience have clearly shown that there is a relationship between mind and behaviour. It has been shown that using positive visualisation techniques and feeling positive emotions, one can bring about significant changes in bodily processes. Ornish has shown this in a number of studies with his patients. In these studies a person with blocked arteries was made to visualise that blood was flowing through her/his blocked arteries. After practicing this over a period of time, significant relief was obtained by these patients as the degree of blockage became significantly less. Use of mental imagery, i.e. images generated by a person in her/his mind, have been used to cure various kinds of phobias (irrational fears of objects and situations). A new discipline called Psychoneuroimmunology has emerged which emphasises the role played by the mind in strengthening the immune system.

Activity 1.1

Imagine and visualise yourself in the following situations. Mention three psychological processes involved in each situation.

1. *You are writing an essay for a competition.*
2. *You are chatting with a friend on an interesting topic.*
3. *You are playing football.*
4. *You are watching a soap opera on TV.*
5. *Your best friend has hurt you.*
6. *You are appearing in an examination.*
7. *You are expecting an important visitor.*
8. *You are preparing a speech to deliver in your school.*
9. *You are playing chess.*
10. *You are trying to figure out the answer of a difficult mathematics problem.*

Discuss your answers with the teacher and classmates.

Popular Notions about the Discipline of Psychology

We mentioned above that everyday, almost everyone of us acts like a psychologist. We

try to understand why someone behaved in the manner in which s/he did and come up with ready explanations. Not only this, most of us have developed our own theory of human behaviour. If we want some worker to perform better than s/he has in the past, we know that we will need to push her/him. Maybe even use a stick because people are basically lazy. Such popular theories of human behaviour based on common sense may or may not be true if investigated scientifically. In fact, you will find that common sensical explanations of human behaviour are based on hindsight and explain very little. For example, if a friend you love goes away to a distant place, what will happen to your attraction for her/him? There are two sayings which you may recall to answer this question. One of them is "Out of sight, out of mind". The second one is "Distance makes the heart grow fonder". Both of them make opposite statements, so which one is true. The explanation you choose will depend on what happens in your life after your friend leaves. Suppose you are able to find a new friend, the saying "Out of sight, out of mind" will be used by you or others to explain your behaviour. If you are unable to find a new friend, you will keep remembering your friend fondly. In this case, the saying "Distance makes the heart grow fonder" will explain your behaviour. Notice that in both cases the explanation follows the occurrence of behaviour. Common sense is based on hindsight. Psychology as a science looks for patterns of behaviour which can be predicted and not explained after the behaviour occurs.

Scientific knowledge generated by psychology often runs against common sense. One such example is a study performed by Dweck (1975). She was concerned with children who gave up too easily when faced with a difficult problem or failure. She wondered how they could be helped. Common sense tells us to give them easy problems in order to increase their success rate so that their confidence goes up. Only later should we give them difficult problems which they will be able to solve because of their new-found confidence. Dweck's study tested this. She took two groups of students who were trained for 25 days in solving math problems. The first group was given easy problems which they were always able to solve. The second group had a mix of easy and difficult problems. Obviously, in case of difficult problems, they failed. Whenever this happened Dweck told them that their failure was because they had not tried hard enough and persuaded them not to give up and keep trying. After the training period was over, a new set of math problems were given to the two groups. What Dweck found goes against common belief. Those who had always succeeded because they were given easy problems, gave up much faster when they faced failure than those who had experience of both success and failure and were taught to attribute failure to their lack of effort.

There are many other common sense notions which you may not find to be true. Not too long ago it was believed in some cultures that men are more intelligent than women or women cause more accidents than men. Empirical studies have shown that both of these are untrue. Common sense also tells us that one is not able to give one's best if you are asked to perform before a large audience. Psychological studies have shown that if you have practiced well, you may actually perform better because the presence of others helps your performance.

It is hoped that as you go through this textbook you will discover that many of your beliefs and understanding of human behaviour will change. You will also gather that psychologists are different from astrologers, *tantriks* and palm readers because they systematically examine propositions based on data to develop principles about human behaviour and other psychological phenomena.

Activity 1.2

Ask a cross-section of students about what they think psychology is? Draw a comparison between what they say and what the textbook tells you. What conclusion can you draw?

Evolution of Psychology

Psychology as a modern discipline, which is influenced to a large extent by Western developments, has a short history. It grew out of ancient philosophy concerned with questions of psychological significance. We mentioned earlier that the formal beginning of modern psychology is traced back to 1879 when the first experimental laboratory was established in Leipzig, Germany by Wilhelm Wundt. Wundt was interested in the study of conscious experience and wanted to analyse the constituents or the building blocks of the mind. Psychologists during Wundt's time analysed the structure of the mind through introspection and therefore were called structuralists. **Introspection** was a procedure in which individuals or subjects in psychological experiments were asked to describe in detail, their own mental processes or experiences. However, introspection as a method did not satisfy many other psychologists. It was considered less scientific because the introspective reports could not be verified by outside observers. This led to the development of new perspectives in psychology.

An American psychologist, William James, who had set up a psychological laboratory in Cambridge, Massachusetts soon after the setting up of the Leipzig laboratory, developed what was called a **functionalist** approach to the study of the human mind. William James believed that instead of focusing on the structure of the mind, psychology should instead study what the mind does and how behaviour functions in making people deal with their environment. For example, functionalists focused on how behaviour enabled people to satisfy their needs. According to William James, consciousness as an ongoing stream of mental process interacting with the environment formed the core of psychology. A very influential educational thinker of the time, John Dewey, used functionalism to argue that human beings seek to function effectively by adapting to their environment.

In the early 20th century, a new perspective called **Gestalt psychology** emerged in Germany as a reaction to the **structuralism** of Wundt. It focused on the organisation of perceptual experiences. Instead of looking at the components of the mind, the Gestalt psychologists argued that when we look at the world our perceptual experience is more than the sum of the components of the perception. In other words, what we experience is more than the inputs received from our environment. When, for example, light from a series of flashing bulbs falls on our retina, we actually experience movement of light. When we see a movie, we actually have a series of rapidly moving images of still pictures falling on our retina. Thus, our perceptual experience is more than the elements. Experience is holistic; it is a Gestalt. We will learn more about the Gestalt psychology when we discuss about the nature of perception in Chapter 5.

Yet another reaction to structuralism came in the form of **behaviourism**. Around 1910, John Watson rejected the ideas of mind and consciousness as subject matters of psychology. He was greatly influenced by the work of physiologists like Ivan Pavlov on classical conditioning. For Watson, mind is not observable and introspection is subjective because it cannot be verified by another observer. According to him, scientific psychology must focus on what is observable and verifiable. He defined psychology as a study of behaviour or responses (to stimuli) which can be measured and studied objectively. Behaviourism of Watson was further developed by many influential psychologists who are known as behaviourists. Most prominent among them was Skinner who applied behaviourism to a wide range of situations and popularised the approach. We will discuss Skinner's work later in this textbook.

Although behaviourists dominated the field of psychology for several decades after Watson, a number of other approaches and views about psychology and its subject matter were developing around the same time. One person who shook the world with his radical view of human nature was Sigmund Freud. Freud

viewed human behaviour as a dynamic manifestation of unconscious desires and conflicts. He founded **psychoanalysis** as a system to understand and cure psychological disorders. While Freudian psychoanalysis viewed human beings as motivated by unconscious desire for gratification of pleasure seeking (and often, sexual) desires, the **humanistic perspective** in psychology took a more positive view of human nature. Humanists, such as Carl Rogers and Abraham Maslow, emphasised the free will of human beings and their natural striving to grow and unfold their inner potential. They argued that behaviourism with its emphasis on behaviour as determined by environmental conditions undermines human freedom and dignity and takes a mechanistic view of human nature.

These different approaches filled the history of modern psychology and provided multiple perspectives to its development. Each of these perspectives has its own focus and draws our attention to the complexity of psychological processes. There are strengths as well as weaknesses in each approach. Some of these approaches have led to further

Box 1.1 Some Interesting Landmarks in the Evolution of Modern Psychology

1879 *Wilhelm Wundt establishes the first psychology laboratory in Leipzig, Germany.*

1890 *William James publishes Principles of Psychology.*

1895 *Functionalism is formulated as a system of psychology.*

1900 *Sigmund Freud develops Psychoanalysis.*

1904 *Ivan Pavlov wins the Nobel Prize for his work on digestive system that led to understanding of principles of development of responses.*

1905 *Intelligence test developed by Binet and Simon.*

1912 *Gestalt psychology is born in Germany.*

1916 *First Psychology Department at Calcutta University is established.*

1922 *Psychology is included in Indian Science Congress Association.*

1924 *Indian Psychological Association is founded.*

1924 *John B. Watson publishes 'Behaviourism', a book that led to the foundation of behaviourism.*

1928 *N.N. Sengupta and Radhakamal Mukerjee publish the first textbook on Social Psychology (London : Allen & Unwin).*

1949 *Psychological Research Wing of the Defence Science Organisation of India is established.*

1951 *Humanistic psychologist Carl Rogers publishes Client-Centred Therapy.*

1953 *B.F. Skinner publishes 'Science and Human Behaviour', strengthening behaviourism as a major approach to psychology.*

1954 *Humanistic psychologist Abraham Maslow publishes 'Motivation and Personality'.*

1954 *Bureau of Psychology is established at Allahabad.*

1955 *National Institute of Mental Health and Neurosciences (NIMHANS) is established at Bangalore.*

1962 *Hospital for Mental Diseases in Ranchi is established.*

1973 *Konrad Lorenz and Niko Tinbergen win the Nobel Prize for their work on built-in species-specific animal behaviour patterns that emerge without any prior experience/ learning.*

1978 *Herbert Simon wins the Nobel Prize for work on decision-making.*

1981 *David Hubel and Torsten Wiesel win the Nobel Prize for their research on vision cells in the brain.*

1981 *Roger Sperry wins the Nobel Prize for split-brain research.*

1989 *National Academy of Psychology (NAOP) India was founded.*

1997 *National Brain Research Centre (NBRC) is established at Gurgaon, Haryana.*

2002 *Daniel Kahneman wins the Nobel Prize for research on human judgment and decision-making under uncertainty.*

2005 *Thomas Schelling wins the Nobel Prize for his work in applying Game Theory to understanding of conflict and cooperation in economic behaviour.*

developments in the discipline. Aspects of Gestalt approach and structuralism were combined and led to the development of the **cognitive perspective** which focuses on how we know about the world. **Cognition** is the process of knowing. It involves thinking, understanding, perceiving, memorising, problem solving and a host of other mental processes by which our knowledge of the world develops, making us able to deal with the environment in specific ways. Some cognitive psychologists view the human mind as an information processing system like the computer. Mind, according to this view is like a computer and it receives, processes, transforms, stores and retrieves information. Modern cognitive psychology views human beings as actively constructing their minds through their exploration into the physical and the social world. This view is sometimes called **constructivism**. Piaget's view of child development which will be discussed later is considered a constructivist theory of development of the mind. Another Russian psychologist Vygotsky went even further to suggest that the human mind develops through social and cultural processes in which the mind is viewed as culturally constructed through joint interaction between adults and children. In other words, while for Piaget children actively construct their own minds, Vygotsky took a view that mind is a joint cultural construction and emerges as a result of interaction between children and adults.

Development of Psychology in India

The Indian philosophical tradition is rich in its focus on mental processes and reflections on human consciousness, self, mind-body relations, and a variety of mental functions such as cognition, perception, illusion, attention and reasoning, etc. Unfortunately, philosophical roots in the Indian tradition have not influenced the development of modern psychology in India. The development of the discipline in India continues to be dominated by western psychology, although some attempts have been made to find points of departure both within the country and abroad. These attempts have tried to establish the truth value of various assertions in Indian philosophical traditions through scientific studies.

The modern era of Indian psychology began in the Department of Philosophy at Calcutta University where the first syllabus of experimental psychology was introduced and the first psychology laboratory was established in 1915. Calcutta University started the first Department of Psychology in the year 1916 and another Department of Applied Psychology in 1938. The beginning of modern experimental psychology at Calcutta University was greatly influenced by the Indian psychologist Dr. N.N. Sengupta who was trained in USA in the experimental tradition of Wundt. Professor G. Bose was trained in Freudian psychoanalysis, another area which influenced the early development of psychology in India. Professor Bose established Indian Psychoanalytical Association in 1922. Departments of Psychology in the Universities of Mysore and Patna were other early centres of teaching and research in psychology. From these modest beginnings, modern psychology has grown as a strong discipline in India with a large number of centres of teaching, research and applications. There are two centers of excellence in psychology supported by the UGC at Utkal University, Bhubaneswar and at the University of Allahabad. About 70 universities offer courses in psychology.

Durganand Sinha in his book *Psychology in a Third World Country: The Indian Experience* published in 1986 traces the history of modern psychology as a social science in India in four phases. According to him, the first phase till independence was a phase with emphasis on experimental, psychoanalytic and psychological testing research, which primarily reflected the development of the discipline in western countries. The second phase till the 1960s was a phase of expansion of psychology in India into different branches of psychology. During this phase Indian psychologists showed a

desire to have an Indian identity by seeking to link western psychology to the Indian context. They did this by using western ideas to understand the Indian situation. However, psychology in India sought to become relevant for Indian society in the post 1960s phase of problem-oriented research. Psychologists became more focused on addressing the problems of the Indian society. Further, the limitations of excessive dependence on western psychology for our social context were also realised. Leading psychologists emphasised the significance of research, which is of relevance to our situation. The search for a new identity of psychology in India led to the phase of indigenisation, which started during the late 1970s. Besides rejecting the western framework, Indian psychologists stressed the need for developing an understanding based on a framework, which was culturally and socially relevant. This trend was also reflected in some attempts to develop psychological approaches based on traditional Indian psychology, which came from our ancient texts and scriptures. Thus, this phase is characterised by development in indigenous psychology, which originated from the Indian cultural context and was relevant for society and Indian psychology based on the Indian traditional knowledge system. While these developments continue, psychology in India is making significant contributions to the field of psychology in the world. It has become more contextual emphasising the need for developing psychological principles, which are rooted in our own social and cultural context. Alongside, we also find that new research studies involving interfaces with neuro-biological and health sciences are being carried out.

Psychology in India is now being applied in diverse professional areas. Not only have psychologists been working with children having special problems, they are employed in hospitals as clinical psychologists, in corporate organisations in the HRD and advertising departments, in sports directorates, in the development sector and in IT industry.

Branches of Psychology

Various fields of specialisation in psychology have emerged over the years. Some of these are discussed in this section.

Cognitive Psychology investigates mental processes involved in acquisition, storage, manipulation, and transformation of information received from the environment along with its use and communication. The major cognitive processes are attention, perception, memory, reasoning, problem solving, decision-making and language. You will be studying these topics later in this textbook. In order to study these cognitive processes, psychologists conduct experiments in laboratory settings. Some of them also follow an ecological approach, i.e. an approach which focuses on the environmental factors, to study cognitive processes in a natural setting. Cognitive psychologists often collaborate with neuroscientists and computer scientists.

Biological Psychology focuses on the relationship between behaviour and the physical system, including the brain and the rest of the nervous system, the immune system, and genetics. Biological psychologists often collaborate with neuroscientists, zoologists, and anthropologists. **Neuropsychology** has emerged as a field of research where psychologists and neuroscientists are working together. Researchers are studying the role of neurotransmitters or chemical substances which are responsible for neural communication in different areas of the brain and therefore in associated mental functions. They do their research on people with normal functioning brain as well as on people with damaged brain by following advanced technologies like EEG, PET and fMRI, etc. about which you will study later.

Developmental Psychology studies the physical, social and psychological changes that occur at different ages and stages over a life-span, from conception to old age. The primary concern of developmental

psychologists is how we become what we are. For many years the major emphasis was on child and adolescent development. However today an increasing number of developmental psychologists show strong interest in adult development and ageing. They focus on the biological, socio-cultural and environmental factors that influence psychological characteristics such as intelligence, cognition, emotion, temperament, morality, and social relationship. Developmental psychologists collaborate with anthropologists, educationists, neurologists, social workers, counsellors and almost every branch of knowledge where there is a concern for growth and development of a human being.

Social Psychology explores how people are affected by their social environments, how people think about and influence others. Social psychologists are interested in such topics as attitudes, conformity and obedience to authority, interpersonal attraction, helpful behaviour, prejudice, aggression, social motivation, inter-group relations and so on.

Cross-cultural and Cultural Psychology examines the role of culture in understanding behaviour, thought, and emotion. It assumes that human behaviour is not only a reflection of human-biological potential but also a product of culture. Therefore behaviour should be studied in its socio-cultural context. As you will be studying in different chapters of this book, culture influences human behaviour in many ways and in varying degrees.

Environmental Psychology studies the interaction of physical factors such as temperature, humidity, pollution, and natural disasters on human behaviour. The influence of physical arrangement of the workplace on health, the emotional state, and interpersonal relations are also investigated. Current topics of research in this field are the extent to which, disposal of waste, population explosion, conservation of energy, efficient use of community resources are associated with and are functions of human behaviour.

Health Psychology focuses on the role of psychological factors (for example, stress, anxiety) in the development, prevention and treatment of illness. Areas of interest for a health psychologist are stress and coping, the relationship between psychological factors and health, patient-doctor relationship and ways of promoting health enhancing factors.

Clinical and Counselling Psychology deals with causes, treatment and prevention of different types of psychological disorders such as anxiety, depression, eating disorders and chronic substance abuse. A related area is counselling, which aims to improve everyday functioning by helping people solve problems in daily living and cope more effectively with challenging situations. The work of clinical psychologists does not differ from that of counselling psychologists although a counselling psychologist sometimes deals with people who have less serious problems. In many instances, counselling psychologists work with students, advising them about personal problems and career planning. Like clinical psychologists, psychiatrists also study the causes, treatment, and prevention of psychological disorders. How are clinical psychologists and psychiatrists different? A clinical psychologist has a degree in psychology, which includes intensive training in treating people with psychological disorders. In contrast, a psychiatrist has a medical degree with years of specialised training in the treatment of psychological disorders. One important distinction is that psychiatrists can prescribe medications and give electroshock treatments whereas clinical psychologist cannot.

Industrial/Organisational Psychology deals with workplace behaviour, focusing on both the workers and the organisations that employ them. Industrial/organisational psychologists are concerned with training employees, improving work conditions, and developing criteria for selecting employees. For example, an organisational psychologist might recommend that a company may adopt a new management structure that would increase

communication between managers and staff. The background of industrial and organisational psychologists often includes training in cognitive and social psychology.

Educational Psychology studies how people of all ages learn. Educational psychologists primarily help develop instructional methods and materials used to train people in both educational and work settings. They are also concerned with research on issues of relevance for education, counselling and learning problems. A related field, **school psychology**, focuses on designing programmes that promote intellectual, social, and emotional development of children, including those with special needs. They try to apply knowledge of psychology in a school setting.

Sports Psychology applies psychological principles to improve sports performance by enhancing their motivation. Sports psychology is a relatively new field but is gaining acceptance worldwide.

Other Emerging Branches of Psychology : The interdisciplinary focus on research and application of psychology has led to the emergence of varied areas like aviation psychology, space psychology, military psychology, forensic psychology, rural psychology, engineering psychology, managerial psychology, community psychology, psychology of women, and political psychology, to name a few. Try the Activity 1.3 to reflect upon your interest areas in psychology.

Activity 1.3

Think about the areas of psychology that you have read in the text. Go through the list given below and rank them from 1 (most interesting) to 11 (least interesting).

Cognitive psychology
Biological psychology
Developmental psychology
Social psychology
Cross-cultural and cultural psychology
Environmental psychology
Health psychology
Clinical and counselling psychology
Industrial/Organisational psychology
Educational psychology
Sports psychology

After going through this textbook and completing the course you may like to return to this activity and mark the changes in your ranking.

Themes of Research and Applications

In the previous section, you got some idea of the various branches of psychology. If you were to ask a simple question about "what psychologists do?", the usual answer will be that they do several things while working in a variety of settings. However, if you try to analyse their work, you will notice that they basically engage in two kinds of activities. One is **research** in psychology; the other is **application** of psychology.

What are some of the themes which provide direction to research and application of psychology? There are several such themes. We will focus on some of them.

Theme 1 : *Psychology like other sciences attempts to develop principles of behaviour and mental processes.*

In research, the main concern is with the understanding and explanation of behaviour and mental events and processes. Psychologists, who choose to engage in research, function more like other scientists. Like them, they draw conclusions which are supported by data. They design and conduct experiments or studies under controlled conditions on a wide range of psychological phenomena. The purpose is to develop general principles about behaviour and mental processes. The conclusions drawn on the basis of such studies apply to everybody and are, therefore, universal. Experimental, comparative, physiological, developmental, social, differential and abnormal psychology are generally regarded as domains representing "basic psychology".

The themes of research in these fields differ from each other. For example, experimental

psychologists study the processes of perception, learning, memory, thinking, and motivation, etc., using experiment as their method of enquiry, whereas physiological psychologists attempt to examine physiological bases of these behaviours. Developmental psychologists study qualitative and quantitative changes in behaviour from the beginning of human life to its end, whereas social psychologists focus on the study of experience and behaviour of individuals as they take place in social contexts.

Theme 2 : *Human behaviour is a function of the attributes of persons and environment.*

Kurt Lewin first proposed the famous equation B = f(P,E) – which suggests that behaviour is the product of a person and her/ his environment. What this equation simply tells us is that the variations we find in human behaviour are largely due to the fact that persons differ with respect to their various attributes because of their genetic endowments and diverse experiences and so do the environments they are placed in. Here the environment is conceptualised as it is perceived or made sense of by the person. Psychologists have for a long time considered that no two individuals are the same, if one considers their psychological attributes. They vary with respect to their intelligence, interests, values, aptitudes and various other personality characteristics. In fact, psychological tests came to be constructed to measure such differences. A discipline called, differential psychology, which focused on individual differences emerged and flourished in the late nineteenth and early twentieth century. Most of it still remains in the form of personality psychology. Psychologists believe that although, core psychological processes are universal, they are susceptible to individual dispositions. Besides individual differences, psychologists also believe that there are variations in behaviour which occur due to environmental factors. This is a view which psychologists have taken from anthropologists, evolutionary theorists and biologists. Psychologists look for explanations of various psychological phenomena based on individual-environment interactions. Although it is difficult, psychologists do seek out the relative importance of heredity and environment in explaining human behaviour.

Theme 3 : *Human behaviour is caused.*

Most psychologists believe that all human behaviour can be explained in terms of causes which are internal (to the organism) or external having location in the outside environment. Causal explanations are central to all sciences because without understanding them no prediction will be possible. Although, psychologists look for causal explanations of behaviour, they also realise that simple linear explanations, such as *X Causing Y* do not hold true. There is no one cause of behaviour. Human behaviour has multiple causes. Psychologists, therefore, look for causal models where a set of interdependent variables are used to explain a behaviour. When it is said that behaviour has multiple causes, it means that it is difficult to pinpoint one cause of a behaviour because it may itself be caused by another variable, which in turn may be caused by some other.

Theme 4 : *Understanding of human behaviour is culturally constructed.*

This is a theme which has recently surfaced. There are psychologists who believe that most psychological theories and models are Euro-American in nature and therefore, do not help us in understanding behaviours in other cultural settings. Psychologists from Asia, Africa and Latin America have been critical of Euro-American approaches which are propagated as universal. A similar critique is made by feminists who argue that psychology offers a male perspective and ignores the perspective of women. They argue in favour of a dialectical approach which will accommodate both male and female perspectives in understanding human behaviour.

Theme 5 : *Human behaviour can be controlled and modified through the application of psychological principles.*

Why do scientists like to know how certain events can be controlled, be they physical or psychological? Their concern arises from their desire to develop techniques or methods that will improve the quality of human life. Psychologists also seek the same while applying knowledge generated by them.

This often requires removal of certain difficulties or adverse conditions that individuals experience in different phases of their life. Consequently, psychologists make certain interventions into the lives of needy people. This applied role of psychologists has, on the one hand, brought the subject closer to the life of people in general than other social science subjects and in knowing the limits of the applicability of its principles. On the other hand, this role has also been very helpful in popularising psychology as a subject in itself. Thus, several independent branches of psychology have emerged that try to use psychological theories, principles and facts to diagnose and resolve problems related to industrial and organisational settings, clinical services, education, environment, health, community development and so on. Industrial psychology, organisational psychology, clinical psychology, educational psychology, engineering psychology and sports psychology represent some of the areas in which psychologists are engaged in delivering services to individuals, groups or institutions.

Basic vs Applied Psychology

It may be noted at this point that various areas put under the rubrics of "basic" and "applied" psychology are identified only on the basis of their emphasis on the study of certain subject matters and broader concerns. There is no sharp cleavage between research and application of psychology. For example, basic psychology provides us with theories and principles that form the basis of application of psychology and applied psychology provides us with different contexts in which the theories and principles derived from research can be meaningfully applied. On the other hand, research is an integral part of even those fields of psychology that are mainly characterised by or subsumed under the category of application. Due to ever increasing demands of psychology in different settings, many fields that were regarded as primarily "research-oriented" in previous decades, have also gradually turned into "application-oriented". Newly emerging disciplines like applied experimental psychology, applied social psychology, and applied developmental psychology indicate that in fact all psychology has the potential of application and is basically applied in nature.

Thus, there is seemingly no fundamental difference between research and application of psychology. These activities are highly interrelated and mutually reinforcing. Their mutual interactions and pervasive influences on each other have become so specific that several offshoots have emerged in recent years with very specific emphasis on their subject matters. Thus, ecological psychology, environmental psychology, cross-cultural psychology, biological psychology, space psychology, and cognitive psychology, to mention a few, have come up as new and frontier areas of research and application that previously formed part of other fields of psychology. These newer developments require highly specialised research skills and training on the part of researchers than ever before.

Psychology and Other Disciplines

Any discipline, which deals with people, would definitely recognise the relevance of the knowledge of psychology. Similarly psychologists also acknowledge the relevance of other disciplines in understanding human behaviour. This trend has led to the emergence of interdisciplinary approach in the field of psychology. Researchers and scholars in science, social science and humanities have felt the significance of psychology as a discipline. Figure 1.1 clearly shows the

relationship of psychology with other disciplines. In studying brain and behaviour, psychology shares its knowledge with neurology, physiology, biology, medicine and computer science. In studying human behaviour (its meaning, growth and development) in a socio-cultural context, psychology shares its knowledge with anthropology, sociology, social work, political science and economics. In studying mental activities involved in creation of literary texts, music and drama, psychology shares its knowledge with literature, art and music. Some of the major disciplines linked to the field of psychology are discussed below:

Philosophy : Until the end of the 19th century, certain concerns that are now part of contemporary psychology like, what is the nature of the mind or how do humans come to know their motivations and emotions were the concerns of philosophers. In the later part of the 19th century, Wundt and other psychologists adopted an experimental approach to these questions and contemporary psychology emerged. Despite the emergence of psychology as a science, it greatly draws from philosophy, particularly with respect to methods of knowing, and various domains of human nature.

Medicine : Doctors have realised that the maxim, healthy body requires a healthy mind, is actually true. A large number of hospitals now employ psychologists. The role of psychologists in preventing people from engaging in health hazardous behaviours and in adhering to the prescribed doctors' regimen are some of the important areas where the two disciplines have come together. While treating patients suffering from cancer, AIDS, and the physically challenged, or handling patients in the Intensive Care Unit, and patients during post operative care doctors have also felt the need for psychological counselling. A successful doctor looks at the psychological as well as physical well-being of the patients.

Economics, Political Science and Sociology : As sister social science disciplines, these three have drawn considerably from psychology and have enriched it as well. Psychology has contributed a great deal to the study of micro-level economic behaviour, particularly in understanding consumer behaviour, savings behaviour and in decision-making. American economists have used data on consumer sentiments to predict economic growth. Three scholars who have worked on such problems have received the Nobel Prize in Economics, namely H. Simon, D. Kahneman and T. Schelling. Like economics, political science too draws considerably from psychology, particularly, in understanding issues related to exercise of power and authority, nature of political conflicts and their resolutions, and voting behaviour. Sociology and psychology come together to explain and understand the behaviour of individuals within different socio-cultural contexts. Issues related to socialisation, group and collective behaviour, and intergroup conflicts gain from both these disciplines.

Computer Science : From the very beginning, the effort of computer science has been in mimicking the human mind. One can see it in terms of how a 'computer' is structured, its memory organised, sequential and simultaneous (read parallel) processing of information. Computer scientists and engineers are seeking to make computers not only more and more intelligent but also machines which can sense and feel. Developments in both these disciplines have brought about significant advancement in the field of cognitive sciences.

Law and Criminology : A skilled lawyer and a criminologist requires knowledge of psychology in answering such questions as: How well a witness remembers an accident, a street fight, or a murder? How well can s/he report such facts when taking the witness stand in the court? What factors influence the decision which is taken by the jury? What are the dependable signs of guilt and falsehood?

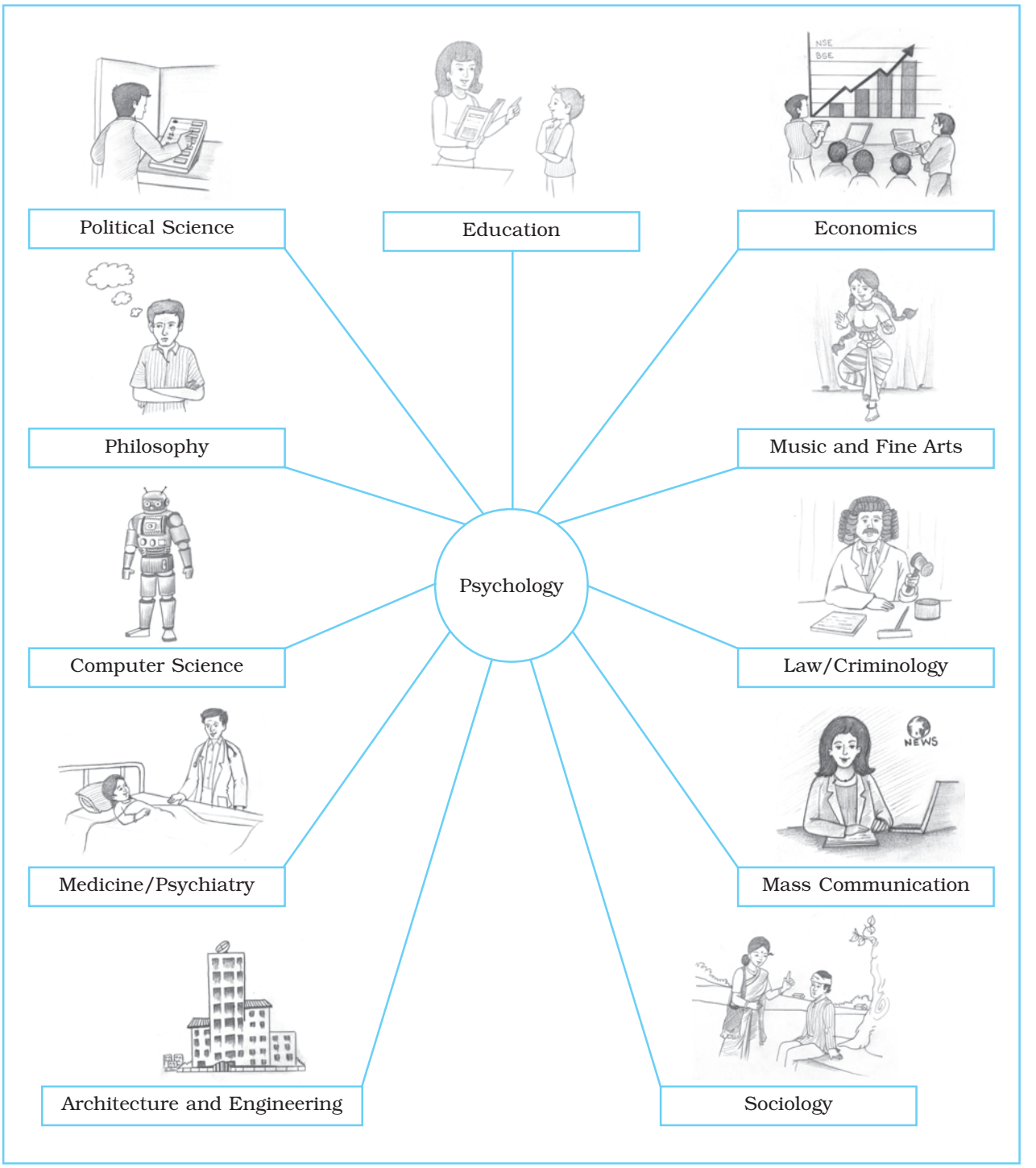

Fig.1.1 : Psychology and Other Disciplines

What factors are held important in holding a culprit responsible for her/his action? What degree of punishment is considered just for a criminal act? Psychologists seek to answer these questions. Currently, a number of psychologists are involved in research on such

issues, the answers to which would help the legal system of the country in the future.

Mass Communication : The print and the electronic media have entered in our lives in a very big way. They have a major influence on our thinking, attitudes and our emotions. If they have brought us closer together, they have also reduced cultural diversities. The impact of media on the formation of attitudes of children and their behaviour is a domain where both these disciplines come together. Psychology also helps in developing strategies for better and effective communication. A journalist in reporting news must know the reader's interests in the story. Since most stories deal with human events, knowledge of their motives and emotions is very important. A story will have more impact if it is based on a background of psychological knowledge and insight.

Music and Fine Arts : Music and psychology have converged in many areas. Scientists have made use of music in raising work performance. Music and emotions is another area in which a number of studies have been carried out. Musicians in India have recently started experimenting with what they call 'Music Therapy'. In this they use different *'Ragas'* for curing certain physical ailments. The efficacy of music therapy still remains to be proven.

Architecture and Engineering : At first glance the relationship between psychology and architecture and engineering would appear improbable. But such is actually not the case. Ask any architect, s/he must satisfy her/his clients by providing mental and physical space through her design and satisfy aesthetically. Engineers must also take into account human habits in their plans for safety, for example, on streets and highways. Psychological knowledge helps in a big way in designing of all mechanical devices and displays.

To sum up, psychology is located at the intersection of many fields of knowledge pertaining to human functioning.

Psychologists at Work

Psychologists today work in a variety of settings where they can apply psychological principles for teaching and training people to cope effectively with the problems of their lives. Often referred to as "human service areas" they include clinical, counselling, community, school and organisational psychology.

Clinical psychologists specialise in helping clients with behavioural problems by providing therapy for various mental disorders and in cases of anxiety or fear, or with stresses at home or at work. They work either as private practitioners or at hospitals, mental institutions, or with social agencies. They may be involved in conducting interviews and administering psychological tests to diagnose the client's problems, and use psychological methods for their treatment and rehabilitation. Job opportunities in clinical psychology attract quite a few to this field of psychology.

Counselling psychologists work with persons who suffer from motivational and emotional problems. The problems of their clients are less serious than those of the clinical psychologists. A counselling psychologist may be involved in vocational rehabilitation programmes, or helping persons in making professional choices or in adjusting to new and difficult situations of life. Counselling psychologists work for public agencies such as mental health centres, hospitals, schools, colleges and universities.

Community psychologists generally focus on problems related to community mental health. They work for mental health agencies, private organisations and state governments. They help the community and its institutions in addressing physical and mental health problems. In rural areas they may work to establish a mental health centre. In urban areas they may design a drug rehabilitation programme. Many community psychologists also work with special populations such as the elderly or the physically or mentally challenged. Besides the redirection and evaluation of various

programmes and plans, community based rehabilitation (CBR) is of major interest to community psychologists.

School psychologists work in educational systems, and their roles vary according to the levels of their training. For example, some school psychologists only administer tests, whereas others also interpret test results to help students with their problems. They also help in the formulation of school policies. They facilitate communication between parents, teachers and administrators, and also provide teachers and parents with information about the academic progress of a student.

Organisational psychologists render valuable help in dealing with problems that the executives and employees of an organisation tend to face in their respective roles. They provide organisations with consultancy services and organise skill training programmes in order to enhance their efficiency and effectiveness. Some organisational psychologists specialise in Human Resource Development (HRD), while others in Organisational Development and Change Management programmes.

Psychology in Everyday Life

The discussion above may have clarified that psychology is not only a subject that satisfies some of the curiosities of our mind about human nature, but it is also a subject that can offer solutions to a variety of problems. These may range from purely personal (for example, a daughter having to face an alcoholic father or a mother dealing with a problem child) to those that may be rooted within the family set up (for example, lack of communication and interaction among family members) or in a larger group or community setting (for example, terrorist groups or socially isolated communities) or may have national or international dimensions. Problems related to education, health, environment, social justice, women development, intergroup relations, etc. are pervasive. While the solution of these problems may involve political, economic and social reforms, interventions at the individual levels are also needed in order to change. Many of these problems are largely of psychological nature and they result from our unhealthy thinking, negative attitude towards people and self and undesirable patterns of behaviour. A psychological analysis of these problems helps both in having a deeper understanding of these problems and also in finding their effective solutions.

The potential of psychology in solving the problems of life is being realised more and more. Media has played a vital role in this respect. You may have seen on television counsellors and therapists suggesting solutions to a variety of problems related to children, adolescents, adults and the elderly people. You may also find them analysing vital social problems relating to social change and development, population, poverty, interpersonal or intergroup violence, and environmental degradation. Many psychologists now play an active role in designing and executing intervention programmes in order to provide people with a better quality of life. Hence, it is no surprise that we find psychologists working in diverse settings such as schools, hospitals, industries, prisons, business organisations, military establishments, and in private practice as consultants helping people solve problems in their respective settings.

Besides helping you in rendering social service to others, the knowledge of psychology is also personally relevant to you in your day-to-day life. The principles and methods of psychology that you will learn in this course should be made use of in analysing and understanding yourself in relation to others. It is not that we do not think about ourselves. But very often, some of us think very highly of ourselves and any feedback that contradicts our opinion about ourselves is rejected because we engage in what is called a defensive behaviour. In some other cases, persons come to acquire a habit of running down themselves. Both conditions do not permit us to grow. We need to have a positive and balanced understanding of ourselves. You

may use psychological principles in a positive manner to develop good habits of study for improving your learning and memory, and for solving your personal and interpersonal problems by using appropriate decision-making strategies. You will also find it of use to reduce or alleviate the stress of examination. Thus, the knowledge of psychology is quite useful in our everyday life, and is rewarding from personal as well as social points of view.

Key Terms

Behaviour, Behaviourism, Cognition, Cognitive approach, Consciousness, Constructivism, Developmental psychology, Functionalism, Gestalt, Gestalt psychology, Humanistic approach, Introspection, Mind, Neuropsychology, Physiological psychology, Psychoanalysis, Sociology, Stimulus, Structuralism

Summary

- *Psychology is a modern discipline aimed at understanding the complexities of mental processes, experiences and behaviour of individuals in different contexts. It is treated as a natural as well as a social science.*
- *The major schools of psychological thought are structuralism, functionalism, behaviourism, Gestalt school, psychoanalysis, humanistic psychology and cognitive psychology.*
- *Contemporary psychology is multivocal as it is characterised by many approaches or diverse views, which explain behaviour at different levels. These approaches are not mutually exclusive. Each provides valuable insights into the complexities of human functioning. The cognitive approach uses thought processes as central to psychological functions. The humanistic approach views human functioning as characterised by a desire to grow, be productive and fulfill human potential.*
- *Today psychologists work in many specialised fields which have their own theories and methods. They make efforts to develop theories and solve problems in specific domains. Some of the major fields of psychology are: cognitive psychology, biological psychology, health psychology, developmental psychology, social psychology, educational and school psychology, clinical and counselling psychology, environmental psychology, industrial/organisational psychology, sports psychology.*
- *More recently a need is felt to have multi/interdisciplinary initiatives to arrive at a better understanding of reality. This has led to a collaboration across disciplines. Interests of psychology overlap with social sciences (e.g., economics, political science, sociology), biosciences (e.g., neurology, physiology, medicine), mass communication, and music and fine arts. Such efforts have led to fruitful research and application.*
- *Psychology is a discipline not merely contributing to the development of theoretical knowledge about human behaviour, but contributing to the solution of problems at different levels. Psychologists are employed to help in diverse activities in a variety of settings including schools, hospitals, industries, training institutes, military and government establishments. Many of them are doing private practice and are consultants.*

Review Questions

1. What is behaviour? Give examples of overt and covert behaviour.
2. How can you distinguish scientific psychology from the popular notions about the discipline of psychology?
3. Give a brief account of the evolution of psychology.

4. What are the problems for which collaboration of psychologists with other disciplines can be fruitful? Take any two problems to explain.
5. Differentiate between (a) a psychologist and a psychiatrist (b) a counsellor and a clinical psychologist.
6. Describe some of the areas of everyday life where understanding of psychology can be put to practice.
7. How can knowledge of the field of environmental psychology be used to promote environment friendly behaviour?
8. In terms of helping solve an important social problem such as crime, which branch of psychology do you think is most suitable. Identify the field and discuss the concerns of the psychologists working in this field.

Project Ideas

1. This chapter tells you about several professionals in the field of psychology. Contact a psychologist who fits into one of the categories and interview the person. Have a list of questions prepared beforehand. Possible questions could be: (i) What kind of education is necessary for your particular job? (ii) Which college/university would you recommend for the study of this discipline? (iii) Are there many jobs available today in your area of work? (iv) What would a typical day at work be like for you – or is there no such thing as "typical"? (v) What motivated you to enter this line of work?
   Write a report of your interview and include your specific reactions.
2. Go to the library or some bookstore or surf the internet and obtain names of some books (fiction/non-fiction or films), which have reference to applications of psychology.
   Prepare a report giving a brief synopsis.

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Chapter 2

Methods of Enquiry in Psychology

After reading this chapter, you would be able to

- explain the goals and nature of psychological enquiry,
- understand different types of data used by psychologists,
- describe some important methods of psychological enquiry,
- understand the methods of analysing data, and
- learn about the limitations of psychological enquiry and ethical considerations.

An idea that is developed and put into action is more important than an idea that exists only as an idea.

– Gautam Buddha

Contents

Introduction
Goals of Psychological Enquiry
Steps in Conducting Scientific Research
Alternative Paradigms of Research
Nature of Psychological Data
Some Important Methods in Psychology
Observational Method
Example of an Experiment (Box 2.1)
Experimental Method
Correlational Research
Survey Research
Example of Survey Method (Box 2.2)
Psychological Testing
Case Study
Analysis of Data
Quantitative Method
Qualitative Method
Limitations of Psychological Enquiry
Ethical Issues

Key Terms
Summary
Review Questions
Project Ideas

Introduction

You have read in the first chapter that psychology is the study of experiences, behaviours, and mental processes. You may now be curious to know how psychologists study these phenomena. In other words, what methods are used to study behaviour and mental processes? Like all scientists, psychologists seek to describe, predict, explain and control what they study. For this, psychologists rely on formal, systematic observations to address their questions. It is the methodology that makes psychology a scientific endeavour. Psychologists use a variety of research methods because questions about human behaviour are numerous and all of them cannot be studied by a single method. Methods such as observation, experimental, correlational research, survey, psychological testing and case study are more frequently used to study the problems of psychology. This chapter will familiarise you with the goals of psychological enquiry, the nature of information or data that we collect in psychological studies, the diverse range of methodological devices available for the study of psychology, and some important issues related to psychological studies.

Goals of Psychological Enquiry

Like any scientific research, psychological enquiry has the following goals: **description**, **prediction**, **explanation**, and **control** of behaviour, and **application** of knowledge so generated, in an objective manner. Let us try to understand the meaning of these terms.

Description : In a psychological study, we attempt to describe a behaviour or a phenomenon as accurately as possible. This helps in distinguishing a particular behaviour from other behaviours. For example, the researcher may be interested in observing study habits among students. Study habits may consist of diverse range of behaviours, such as attending all your classes regularly, submitting assignments on time, planning your study schedule, studying according to the set schedule, revising your work on a daily basis etc. Within a particular category there may be further minute descriptions. The researcher needs to describe her/his meaning of study habits. The description requires recording of a particular behaviour which helps in its proper understanding.

Prediction : The second goal of scientific enquiry is prediction of behaviour. If you are able to understand and describe the behaviour accurately, you come to know the relationship of a particular behaviour with other types of behaviours, events, or phenomena. You can then forecast that under certain conditions this particular behaviour may occur within a certain margin of error. For example, on the basis of study, a researcher is able to establish a positive relationship between the amount of study time and achievement in different subjects. Later, if you come to know that a particular child devotes more time for study, you can predict that the child is likely to get good marks in the examination. Prediction becomes more accurate with the increase in the number of persons observed.

Explanation : The third goal of psychological enquiry is to know the causal factors or determinants of behaviour. Psychologists are primarily interested in knowing the factors that make behaviour occur. Also, what are the conditions under which a particular behaviour does not occur. For example, what makes some children more attentive in the class? Why

some children devote less time for study as compared to others? Thus, this goal is concerned with identifying the determinants or antecedent conditions (i.e. conditions that led to the particular behaviour) of the behaviour being studied so that cause-effect relationship between two variables (objects) or events could be established.

Control : If you are able to explain why a particular behaviour occurs, you can control that behaviour by making changes in its antecedent conditions. Control refers to three things: making a particular behaviour happen, reducing it, or enhancing it. For example, you can allow the number of hours devoted to study to be the same, or you can reduce them or there may be an increase in the study hours. The change brought about in behaviour by psychological treatment in terms of therapy in persons, is a good example of control.

Application : The final goal of the scientific enquiry is to bring out positive changes in the lives of people. Psychological research is conducted to solve problems in various settings. Because of these efforts the quality of life of people is a major concern of psychologists. For example, applications of yoga and meditation help to reduce stress and increase efficiency. Scientific enquiry is also conducted to develop new theories or constructs, which leads to further research.

Steps in Conducting Scientific Research

Science is not so defined by *what* it investigates as by *how* it investigates. The scientific method attempts to study a particular event or phenomenon in an objective, systematic, and testable manner. The **objectivity** refers to the fact that if two or more persons independently study a particular event, both of them, to a great extent, should arrive at the same conclusion. For instance, if you and your friend measure the length of a table using the same measuring device, it is likely that both of you would arrive at the same conclusion about its length.

The second characteristic of scientific research is that it follows **systematic** procedure or steps of investigation. It includes the following steps: *conceptualisation of a problem, collection of data, drawing conclusions, and revising research conclusions and theory* (see Fig.2.1). Let us discuss these steps in some detail.

(1) *Conceptualising a Problem* : The process of scientific research begins when a researcher

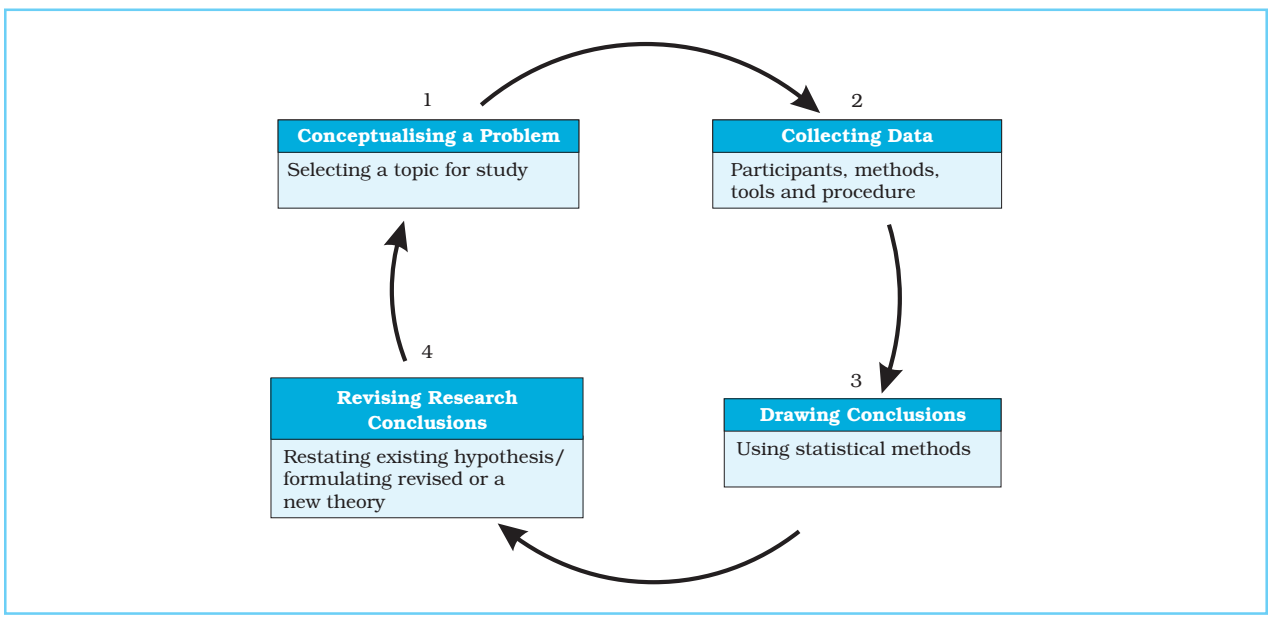

Fig.2.1 : Steps in Conducting Scientific Enquiry

selects a theme or topic for study. Then s/he narrows down the focus and develops specific research questions or problems for the study. This is done on the basis of review of past research, observations, and personal experiences. For example, earlier you read that a researcher was interested in observing the study habits of students. For this purpose, s/he may identify different facets of study habits first, and then decide whether s/he is interested in study habits shown in the class or at home.

In psychology we study a diverse range of problems related to behaviour and experiences. These problems may be related to (a) understanding our own behaviour (for example, how do I feel and behave when I am in a state of joy or grief? How do we reflect on our own experiences and behaviour? Why do we forget?); (b) understanding other individual's behaviour (for example, Is Abhinav more intelligent than Ankur? Why is someone always not able to complete her or his work on time? Can the habit of smoking be controlled? Why do some people suffering from chronic illness not take medicines?); (c) group influences on individual behaviour (for example, why does Rahim spend more time meeting with people than doing his work?, Why does a cyclist perform better when cycling before a group of persons than when cycling alone?); (d) group behaviour (for example, why does risk-taking behaviour increase when people are in a group?), and (e) organisational level (for example, why are some organisations more successful than others? How can an employer increase the motivation of employees?). The list is long and you will learn about these various facets in subsequent chapters. If you are inquisitive, you can write down a number of problems which you may like to probe.

After identification of the problem, the researcher proceeds by developing a tentative answer of the problem, which is called **hypothesis**. For example, based on the earlier evidence or your observation, you might develop a hypothesis 'greater is the amount of time spent by children in viewing violence on television, higher is the degree of aggression displayed by them'. In your research, you shall now try to prove whether the statement is true or false.

(2) *Collecting Data* : The second step in scientific research is to collect data. Data collection requires developing a research design or a blueprint of the entire study. It requires taking decisions about the following four aspects: (a) participants in the study, (b) methods of data collection, (c) tools to be used in research, and (d) procedure for data collection. Depending upon the nature of the study, the researcher has to decide who would be the participants (or informants) in the study. The participants could be children, adolescents, college students, teachers, managers, clinical patients, industrial workers, or any group of individuals in whom/where the phenomenon under investigation is prevalent. The second decision is related to the use of methods of data collection, such as observation method, experimental method, correlational method, case study, etc. The researcher needs to decide about appropriate tools (for example, interview schedule, observation schedule, questionnaire, etc.) for data collection. The researcher also decides about how the tools need to be administered to collect data (i.e. individual or group). This is followed by actual collection of data.

(3) *Drawing Conclusions* : The next step is to analyse data so collected through the use of statistical procedures to understand what the data mean. This can be achieved through graphical representations (such as preparation of pie-chart, bar-diagram, cumulative frequencies, etc.) and by the use of different statistical methods. The purpose of analysis is to verify a hypothesis and draw conclusions accordingly.

(4) *Revising Research Conclusions* : The researcher may have begun the study with a hypothesis that there exists a relationship between viewing violence on television and aggression among children. S/he has to see whether the conclusions support this

hypothesis. If they do, the existing hypothesis/theory is confirmed. If not, s/he will revise or state an alternative hypothesis/theory and again test it based on new data and draw conclusions which may be verified by future researchers. Thus, research is a continuous process.

Alternative Paradigms of Research

Psychologists suggest that human behaviour can and should be studied following the methods adopted by sciences like physics, chemistry, and biology. The key assumption of this view is that human behaviour is predictable, caused by internal and external forces, and can be observed, measured, and controlled. In order to achieve these goals, the discipline of psychology, for larger part of the twentieth century, restricted itself to the study of overt behaviour, i.e. the behaviour that could be observed and measured. It did not focus on personal feelings, experiences, meanings, etc.

In recent years, a different method known as *interpretive* has emerged. It emphasises understanding over explanation and prediction. It takes the stand that, in view of complex and variable nature of human behaviour and experience, its method of investigation should be different from the method of investigation of the physical world. This viewpoint emphasises the importance of how human beings give meaning to events and actions and interpret them as they occur in a particular context. Let us take the experiences that may occur in some unique contexts, such as persons experiencing suffering due to external factors (for example, people affected by tsunami, earthquake, cyclone) or internal factors (for instance, prolonged illness, etc.). In such types of situations, objective measurement is neither possible nor desirable. Everyone interprets reality in her/his own way based on past experiences and contexts. Therefore, we need to understand the subjective interpretation of the reality. The goal here is to explore the different aspects of human experiences and behaviour without attempting to disturb its natural flow. For example, an explorer does not know what s/he is looking for, how to look for it, and what to expect. Rather, s/he tries to map an uncharted wilderness, with little or no prior knowledge of the area, and her/his main task is to record detailed descriptions of what is found in a particular context.

Both scientific and interpretive traditions are concerned with studying behaviour and experiences of others. What about our own personal experiences and behaviour? As a student of psychology, you may ask yourself the question: why am I feeling sad? Many times you take a pledge that you will control your diet or devote more time to studies. But when it actually comes to eating or studying you forget this. You might be wondering why one does not have control over one's behaviour. Should psychology not help you in analysing your own experiences, thought processes, and behaviour? It certainly should. The psychological enquiry does aim at understanding the self by reflecting on one's own experiences and insights.

Nature of Psychological Data

You may want to consider how psychological data are different as compared to other sciences. Psychologists collect a variety of information from different sources employing diverse methods. The information, also called **data** (singular = *datum*), relate to the individuals' covert or overt behaviour, their subjective experiences, and mental processes. Data form an important input in psychological enquiry. They in fact approximate the reality to some extent and provide an opportunity to verify or falsify our ideas, hunches, notions, etc. It should be understood that data are not independent entities. They are located in a context, and are tied to the method and theory that govern the process of data collection. In other words, data are not independent of the physical or social context, the persons involved, and the time when the behaviour occurs. We behave differently when alone than in a group, or at home and in office. You may

hesitate to talk in front of your parents and teachers but not when you are with friends. You may have also noticed that not all people behave in exactly the same manner in the same situation. The method of data collection (survey, interview, experiment, etc.) used and the characteristics of respondents (such as, individual or group, young or old, male or female, rural or urban, etc.) also influence the nature and quality of data. It is possible that when you interview a student, s/he may report behaving in a particular manner in a given situation. But when you go for actual observation you may find just the opposite of what s/he had reported. Another important feature of data is that it does not in itself speak about reality. Inferences have to be made from data. A researcher attaches meaning to the data by placing it in its proper context.

In psychology, different types of data or information are collected. Some of these types are :

i) *Demographic Information* : This information generally includes personal information like name, age, gender, birth order, number of siblings, education, occupation, marital status, number of children, locality of residence, caste, religion, parental education, occupation, and family income, etc.

ii) *Physical Information* : This category includes information about ecological conditions (hilly/desert/forest), mode of economy, housing conditions, size of rooms, facilities available at home, in the neighbourhood, in the school, mode of transportation, etc.

iii) *Physiological Data* : In some studies physical, physiological and psychological data are collected about height, weight, heart rate, level of fatigue, Galvanic Skin Resistance (GSR), electrical activity of the brain measured by Electro-encephalograph (EEG), blood oxygen levels, reaction time, duration of sleep, blood pressure, pattern of dream, amount of salivation, running and jumping rates (in case of animal studies), etc., are collected.

iv) *Psychological Information* : Psychological information collected, may relate to such areas as intelligence, personality, interest, values, creativity, emotions, motivation, psychological disorders, illusions, delusions, hallucinations, perceptual judgment, thought processes, consciousness, subjective experiences, etc.

The above information could be from the point of view of measurement somewhat crude. Like, in the form of categories (such as high/low, yes/no), ranks which provide ordinal data, viz. first, second, third, fourth, etc., or scores (10, 12, 15, 18, 20, etc.) on scales. We also obtain verbal reports, observation records, personal diaries, field notes, archival data, etc. Such types of information is analysed separately using qualitative methods. You will get some idea about this later in this chapter.

Some Important Methods in Psychology

In the previous section you read about wide variety of data that we collect in psychological studies. All these varieties of data cannot be collected through a single method of enquiry. Psychologists use a variety of methods like Observation, Experimental, Correlational, Survey, Psychological Testing, and Case Study to collect data. The aim of this section is to guide you to select the methods which may be appropriate for different research purposes. For example:

- You can observe the behaviour of spectators watching a football match.
- You can conduct an experiment to see if children taking an examination do better in the classroom in which they had studied the subject or in the examination hall (cause-effect relationship).
- You can correlate intelligence with, say, self-esteem (for prediction purposes).
- You can survey students' attitude towards privatisation of education.
- You can use psychological tests to find out individual differences.
- You can conduct a case study on the development of language in a child.

The main characteristics of these methods are described in the following sections.

Observational Method

Observation is a very powerful tool of psychological enquiry. It is an effective method of describing behaviour. In our daily life, we remain busy with observing numerous things throughout the day. Many times, we do not take notice of what we are seeing or what we have seen. We see but we do not observe. We remain aware of only a few things that we see daily. Have you experienced such a thing? You may also have experienced that if you carefully observe a person or event for some time, you come to know many interesting things about the person or the event. A scientific observation differs from day-to-day observation in many respects. These are :

(a) *Selection* : Psychologists do not observe all the behaviour that they encounter. Rather, they **select** a particular behaviour for observation. For example, you may be interested to know how children studying in Class XI spend their time in school. Two things are possible at this stage. As a researcher, you might think that you have a fairly good idea about what happens in school. You might prepare a list of activities and go to the school with a view to finding out their occurrences. Alternatively, you might think that you do not know what happens in the school and, by your observation you would like to discover it.

(b) *Recording* : While observing, a researcher **records** the selected behaviour using different means, such as marking tallies for the already identified behaviour whenever they occur, taking notes describing each activity in greater detail using short hand or symbols, photographs, video recording, etc.

(c) *Analysis of Data* : After the observations have been made, psychologists **analyse** whatever they have recorded with a view to derive some meaning out of it.

It is important to know that making good observations is a skill. A good observer knows what s/he is looking for, whom s/he wants to observe, *when* and *where* the observation needs to be made, in what form the observation will be recorded, and what methods will be used to analyse the observed behaviour.

Types of Observation

Observation can be of the following types :

(a) *Naturalistic vs Controlled Observation* : When observations are done in a natural or real-life settings (in the above example, it was a school in which observation was made), it is called **naturalistic observation**. In this case the observer makes no effort to control or manipulate the situation for making an observation. This type of observation is conducted in hospitals, homes, schools, day care centers, etc. However, many a times you might need to control certain factors that determine behaviour as they are not the focus of your study. For this reason, many of the studies in psychology are conducted in the laboratory. For example, if you read Box 2.1, you will come to know that smoke could only be introduced in a controlled laboratory situation. This type of observation, called Controlled Laboratory Observation, actually, is obtained in laboratory experiments.

(b) *Non-Participant vs Participant Observation* : Observation can be done in two ways. One, you may decide to observe the person or event from a distance. Two, the observer may become part of the group being observed. In the first case, the person being observed may not be aware that s/he is being observed. For example, you want to observe the pattern of interaction between teachers and students in a particular class. There are many ways of achieving this goal. You can install a video camera to record the classroom activities, which you can see later and analyse. Alternatively, you may decide to sit in a corner of the class without interfering or participating in their everyday activities. This type of observation is called **non-participant observation**. The danger in this type of set-up is that the very fact that someone

Box 2.1 Example of an Experiment

Two American psychologists, Bibb Latane and John Darley, conducted a study in 1970. In order to participate in this study, the students of Columbia University arrived individually at a laboratory. They were given the impression that they would be interviewed on a certain topic. Each student was sent to a waiting room to complete a preliminary questionnaire. Some of them found two other people already seated in the room, while others sat down alone. Soon after the students had started working on the questionnaire, smoke began filling the room through a wall vent. The smoke could hardly be ignored; within four minutes the room contained enough smoke to interfere with vision and breathing. Latane and Darley were primarily interested in knowing how frequently students simply got up and left the room to report the emergency. Most (75 per cent) of the students who were waiting alone reported the smoke, but those reporting in groups were far less. Groups consisting of three naïve students reported it only 38 per cent of the time. When the students waited with two other confederates, who were instructed before hand by the researchers to do nothing, only 10 per cent students reported smoke.

(an outsider) is sitting and observing may bring a change in the behaviour of students and the teacher.

In participant observation, the observer becomes a part of the school or the group of people being observed. In participant observation, the observer takes some time to establish a rapport with the group so that they start accepting her/him as one of the group members. However, the degree of involvement of the observer with the group being observed would vary depending upon the focus of the study.

The advantage of the observation method is that it enables the researcher to study people and their behaviour in a naturalistic situation, as it occurs. However, the observation method is labour intensive, time consuming, and is susceptible to the observer's bias. Our observation is influenced by our values and beliefs about the person or the event. You are familiar with the popular saying: "We see things as we are and not as things are". Because of our biases we may interpret things in a different way than what the participants may actually mean. Therefore, the observer should record the behaviour as it happens and should not interpret the behaviour at the time of observation itself.

Activity 2.1

A few students can observe one period when the psychology teacher is teaching in the class. Note down, in detail, what the teacher does, what the students do, and the entire pattern of interaction between the teacher and the students. Discuss the observations made with other students and teacher. Note the similarities and differences in observation.

Experimental Method

Experiments are generally conducted to establish cause-effect relationship between two sets of events or variables in a controlled setting. It is a carefully regulated procedure in which changes are made in one factor and its effect is studied on another factor, while keeping other related factors constant. In the experiment, cause is the event being changed or manipulated. Effect is the behaviour that changes because of the manipulation.

The Concept of Variable

You read earlier that in the experimental method, a researcher attempts to establish causal relationship between two variables. What is a variable? Any stimulus or event

which varies, that is, it takes on different values (or changes) and can be measured is a **variable**. An object by itself is not a variable. But its attributes are. For example, the pen that you use for writing is NOT a variable. But there are varieties of pens available in different shapes, sizes, and colour. All of these are variables. The room in which you are sitting is NOT a variable but its size is as there are rooms of different sizes. The height of the individuals (5' to 6') is another variable. Similarly, people of different races have different colours. Young people have started dyeing their hair in different colours. Thus, colour of hair becomes a variable. Intelligence is a variable (there are people with varying levels of intelligence — high, moderate, low). The presence or absence of persons in the room is a variable as shown in the experiment in Box 2.1. Thus, the variation can be in the quality or quantity of objects/events.

Variables are of many types. We will however focus on independent and dependent variables. **Independent variable** is that variable which is manipulated or altered or its strength varied by the researcher in the experiment. It is the effect of this change in the variable which the researcher wants to observe or note in the study. In the experiment conducted by Latane and Darley (Box 2.1), the researchers wanted to examine the effect of the presence of other persons on reporting of the smoke. The independent variable was presence or absence of other persons in the room. The variables on which the effect of independent variable is observed is called **dependent variable**. Dependent variable represents the phenomenon the researcher desires to explain. It is expected that change in the dependent variable will ensue from changes in the independent variable. The frequency of reporting of smoke in the above case was the dependent variable. Thus, the independent variable is the cause, and dependent variable the effect in any experimental situation.

One must remember that independent and dependent variables are interdependent. Neither of them can be defined without the other. Also, independent variable chosen by the researcher is not the only variable that influences the dependent variable. Any behavioural event contains many variables. It also takes place within a context. Independent and dependent variables are chosen because of the researcher's theoretical interest. However, there are many other relevant or extraneous variables that influence the dependent variable, but the researcher may not be interested in examining their effects. These extraneous variables need to be controlled in an experiment so that a researcher is able to pin-point the cause and effect relationship between independent and dependent variables.

Experimental and Control Groups

Experiments generally involve one or more experimental groups and one or more control groups. An experimental group is a group in which members of the group are exposed to independent variable manipulation. The **control group** is a comparison group that is treated in every way like the experimental group except that the manipulated variable is absent in it. For example, in the study by Latane and Darley, there were two experimental groups and one control group. As you may have noted, the participants in the study were sent to three types of rooms. In one room no one was present (control group). In the other two rooms, two persons were already seated (experimental groups). Of the two experimental groups, one group was instructed not to do anything when smoke filled in the room. The other group was not given any instructions. After the experimental manipulation had occured the performance of the control group measured in terms of reporting of smoke was compared with that of the experimental group. It was found that the control group participants reported in maximum numbers about the emergency, followed by the first experimental group members where the participants were not given any instructions, and the second experimental group (consisting of

confederates) reported the emergency situation, the least.

It should be noted that in an experiment, except for the experimental manipulation, other conditions are kept constant for both experimental and control groups. One attempts to control all those relevant variables which can influence the dependent variable. For example, the speed with which smoke started entering the rooms, the total amount of smoke in the rooms, physical and other conditions of the rooms were similar in case of all the three groups. The distribution of participants to experimental and control groups was done **randomly**, a method that ensures that each person has an equal chance of being included in any of the groups. If in one group the experimenter had included only males and in the other group females, the results obtained in the study, could be due to the differences in gender rather than due to experimental manipulation. All relevant variables in experimental studies that might influence the dependent variable need to be controlled. These are of three major types: organismic variables (such as anxiety, intelligence, personality, etc.), situational or environmental variables operating at the time of conducting the experiment (such as noise, temperature, humidity), and sequential variables. The sequence related variables assume significance when the participants in experiments are required to be tested in several conditions. Exposure to many conditions may result in experimental fatigue, or practice effects, which may influence the results of the study and make the interpretation of the findings difficult.

In order to control relevant variables, experimenters use several control techniques. Some illustrations are given below.

- Since the goal of an experiment is to minimise extraneous variables, the best way to handle this problem is to eliminate them from the experimental setting. For example, the experiment may be conducted in a sound-proof and air-conditioned room to eliminate the effect of noise and temperature.
- Elimination is not always possible. In such cases, effort should be made to hold them constant so that their effect remains the same throughout the experiment.
- For controlling organismic (e.g., fear, motivation) and background variables (such as rural/urban, caste, socio-economic status) matching is also used. In this procedure the relevant variables in the two groups are equated or are held constant by taking matched pairs across conditions of the experiment.
- Counter-balancing technique is used to minimise the sequence effect. Suppose there are two tasks to be given in an experiment. Rather than giving the two tasks in the same sequence the experimenter may interchange the order of the tasks. Thus, half of the group may receive the tasks in the order of A and B while the other half in order of B and A or the same individual may be given the task in A, B, B, A order.
- Random assignment of participants to different groups eliminates any potential systematic differences between groups.

The strength of a well-designed experiment is that it can provide, relatively speaking, a convincing evidence of a cause-effect relationship between two or more variables. However, experiments are often conducted in a highly controlled laboratory situation. In this sense, they only simulate situations that exist in the outside world. They are frequently criticised for this reason. The experiments may produce results that do not generalise well, or apply to real situations. In other words, they have low *external validity*. Another limitation of the laboratory experiment is that it is not always feasible to study a particular problem experimentally. For example, an experiment to study the effect of nutritional deficiency on intelligence level of children cannot be conducted as it would be ethically wrong to starve anyone. The third problem is that it is difficult to know and control all the relevant variables.

Field Experiments and Quasi Experiments

If a researcher wants to have high generalisability or to conduct studies which are not possible in laboratory settings, s/he may go to the field or the natural setting where the particular phenomenon actually exists. In other words, s/he may conduct a **field experiment**. For example, a researcher may want to know which method would lead to better learning among students—lecture or demonstration method. For this, a researcher may prefer to conduct an experiment in the school. The researcher may select two groups of participants; teach one group by demonstration method and another group by the normal teaching method for sometime. S/he may compare their performance at the end of the learning session. In such types of experiments, the control over relevant variables is less than what we find in laboratory experiments. Also, it is more time-consuming and expensive.

Many variables cannot be manipulated in the laboratory settings. For example, if you want to study the effect of an earthquake on children who lost their parents, you cannot create this condition artificially in the laboratory. In such situations, the researcher adopts the method of ***quasi*** (the Latin word meaning "as if") **experimentation**. In such types of experiments, the independent variable is selected rather than varied or manipulated by the experimenter. For example, in the experimental group we can have children who lost their parents in the earthquake and in the control group children who experienced the earthquake but did not lose their parents. Thus, a quasi experiment attempts to manipulate an independent variable in a natural setting using naturally occurring groups to form experimental and control groups.

Activity 2.2

Identify the independent and dependent variables from the given hypotheses.

1. *Teachers' classroom behaviour affects students' performance.*
2. *Healthy parent-child relationship facilitates emotional adjustment of children.*
3. *Increase in the level of peer pressure increases the level of anxiety.*
4. *Enriching the environment of young children with special books and puzzles enhances their performance.*

Correlational Research

In psychological research, we often wish to determine the relationship between two variables for prediction purposes. For example, you may be interested in knowing whether "the amount of study time" is related to the "student's academic achievement". This question is different from the one which experimental method seeks to answer in the sense that here you do not manipulate the amount of study time and examine its impact on achievement. Rather, you simply find out the relationship between the two variables to determine whether they are associated, or covary or not. The strength and direction of the relationship between the two variables is represented by a number, known as correlation coefficient. Its value can range from +1.0 through 0.0 to –1.0.

As you can see, the coefficient of correlation is of three types: positive, negative, and zero. A **positive correlation** indicates that as the value of one variable (X) increases, the value of the other variable (Y) will also increase. Similarly when variable X decreases, a decrease in Y too takes place. Suppose, it is found that more time the students spend on studying, the higher was their achievement score. Also the less they studied, the lower was their achievement score. This type of association will be indicated by a positive number, and the stronger the association between studying and achievement, the closer the number would be to +1.0. You may find a correlation of +.85, indicating a strong positive association between study time and achievement. On the other hand, a **negative correlation** tells us that as the value of one variable (X) increases, the value of the other (Y) decreases. For example, you may

hypothesise that as the hours of study time increase, the number of hours spent in other activities will decrease. Here, you are expecting a negative correlation, ranging between 0 and –1.0. It is also possible that sometimes no correlation may exist between the two variables. This is called **zero correlation**. Generally, it is difficult to find zero correlation but the correlations found may be close to zero, e.g., -.02 or +.03. This indicates that no significant relationship exists between two variables or the two variables are unrelated.

Survey Research

You may have read in the newspapers or seen on the television that during elections surveys are conducted to find out if people would vote for a particular political party, or favour a particular candidate. Survey research came into existence to study opinions, attitudes and social facts. Their main concern initially was to find out the existing reality or baseline. So they were used to find out facts such as the literacy rate at a particular time, religious affiliations, income level of a particular group of people, etc.They were also used to find out the attitude of people towards family planning, the attitude towards giving powers to the *panchayati raj* institutions for running programmes related to health, education, sanitation, etc. However, they have now evolved into a sophisticated technique which helps in inferring various kinds of causal relationships. Box 2.2 provides an example of a study using the survey method.

The survey research uses different techniques for collecting information. Included among these techniques are: personal interviews, questionnaires, telephonic surveys, and controlled observations. These techniques are discussed here in some detail.

Personal Interviews

The interview method is one of the most frequently used methods for obtaining information from people. It is used in diverse kinds of situations. It is used by a doctor to obtain information from the patient, an employer when meeting a prospective employee, a sales person interviewing a housewife to know why she uses a certain brand of soap. On television, we often see media persons interviewing people on issues of national and international importance. What happens in an interview? We see that two or more persons sit face-to-face with each

Box 2.2 Example of Survey Method

In December 2004, a survey was conducted by "Outlook Saptahik" magazine (10 January 2005) to know what makes the people of India happy. The survey was conducted in eight big cities, namely Mumbai, Delhi, Kolkata, Bangalore, Hyderabad, Ahmedabad, Jaipur, and Ranchi. 817 persons in the age group of 25-55 years participated in the study. The questionnaire used in the survey contained different types of questions. The first question (Are you happy?) required respondents to give their views on a 5-point scale (5=extremely happy, 4=more or less happy, 3=neither happy nor unhappy, 2=more or less unhappy, 1=extremely unhappy). About 47 per cent people reported that they were extremely happy, 28 per cent were more or less happy, 11 per cent said they were neither happy nor unhappy, and 7 per cent each fell in the last two categories, more or less unhappy, and extremely unhappy. The second question (Can you buy happiness with money?) had three alternatives (Yes, No, Don't know). About 80 per cent people expressed that money can't buy happiness. Another question tried to know "what gives them maximum happiness?" More than 50 per cent respondents reported that peace of mind (52 per cent) and health (50 per cent) gave them maximum happiness. This was followed by responses such as success in work (43 per cent), and family (40 per cent). Another question asked was to know 'what do they do when they feel unhappy or sad?" It was reported that 36 per cent people opted for listening to music, 23 per cent found respite in the company of friends, and 15 per cent went for a movie.

other, in which one person (generally called interviewer) asks the questions and the other person (called interviewee or respondent) answers the questions related to a problem. An interview is a purposeful activity conducted to derive factual information, opinions and attitudes, and reasons for particular behaviour, etc. from the respondents. It is generally conducted face-to-face but sometimes it can also take place over the phone.

There can be two broad types of interviews: **structured or standardised**, and **unstructured or non-standardised**. This distinction is based upon the type of preparation we make before conducting the interview. As we have to ask questions during the interview, it is required that we prepare a list of questions before-hand. The list is called an interview schedule. A structured interview is one where the questions in the schedule are written clearly in a particular sequence. The interviewer has little or no liberty to make changes in the wordings of the questions or the order in which they are to be asked. The responses to these questions are also, in some cases, specified in advance. These are called close-ended questions. In contrast, in an unstructured interview the interviewer has the flexibility to take decisions about the questions to be asked, the wording of the questions, and the sequence in which questions are to be asked. Since responses are not specified in such type of interviews, the respondent can answer the questions in the way s/he chooses to. Such questions are called open-ended questions. For example, if the researcher wants to know about the happiness level of a person, s/he may ask: How happy are you? The respondent may reply to this question the way s/he chooses to answer.

An interview may have the following combinations of participants in an interview situation:

(a) *Individual to Individual* : It is a situation where one interviewer interviews another person.

(b) *Individual to Group* : In this situation, one interviewer interviews a group of persons. One variant of it is called a Focus Group Discussion (FGD).

(c) *Group to Individuals* : It is a situation where one group of interviewers interview one person. You may experience this type of situation when you appear for a job interview.

(d) *Group to Group* : It is a situation where one group of interviewers interview another group of interviewees.

Interviewing is a skill which requires proper training. A good interviewer knows how to make the respondent at ease and get the optimal answer. S/he remains sensitive to the way a person responds and, if needed, probes for more information. If the respondent gives vague answers, the interviewer may try to get specific and concrete answers.

The interview method helps in obtaining in-depth information. It is flexible and adaptable to individual situations, and can often be used when no other method is possible or adequate. It can be used even with children, and non-literate persons. An interviewer can know whether the respondent understands the questions, and can repeat or paraphrase questions. However, interviews require time. Often getting information from one person may take an hour or more which may not be cost-effective.

Questionnaire Survey

The questionnaire is the most common, simple, versatile, and low-cost self-report method of collecting information. It consists of a predetermined set of questions. The respondent has to read the questions and mark the answers on paper rather than respond verbally to the interviewer. They are in some ways like highly structured interviews. Questionnaires can be distributed to a group of persons at a time who write down their answers to the questions and return to the researcher or can be sent through mail. Generally, two types of questions are used in the questionnaire: open-ended and closed-ended. With open-ended questions, the respondent is free to write whatever answer s/he considers appropriate. In the closed-ended type, the questions and their probable

answers are given and the respondent is required to select the correct answer. Examples of closed-ended questions require responses like: Yes/No, True/False, Multiple choice, or using a rating scale. In case of rating scale, a statement is given and the respondent is asked to give her/his views on a 3-point (Agree, Undecided, Disagree), or 5-point (Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree) or 7-point, 9-point, 11-point or 13-point scale. In some cases, the participants are asked to rank a number of things in a preferential order. The questionnaire is used for collecting background and demographic information, information about past behaviour, attitudes and opinions, knowledge about a particular topic, and expectations and aspirations of the persons. Sometimes a survey is conducted by sending the questionnaire by mail. The main problem of a mailed questionnaire is poor response from the respondents.

Activity 2.3

An investigator wants to study people's attitude towards welfare programmes by circulating a questionnaire via the Internet. Is this study likely to reflect the views of the general population accurately? Why or why not?

Telephone Survey

Surveys are also conducted through **telephone**, and now-a-days you must have seen programmes asking you to send your views through mobile phones' SMS. The telephone survey helps in reducing time. However, since the respondents do not know the interviewer, the technique is fraught with uncooperativeness, reluctance, and superficial answers by the respondents. There is also a possibility that those responding may differ from those not responding, e.g., on age, gender, income levels, education levels, etc., besides their psychological characteristics. This will lead to very biased kinds of results.

The method of observation have been discussed earlier. This method is also used for conducting surveys. Each method has its own advantages and limitations. The researcher needs to exercise caution in selecting a particular method.

The survey method has several advantages. First, information can be gathered quickly and efficiently from thousands of persons. Second, since surveys can be conducted quickly, public opinions on new issues can be obtained almost as soon as the issues arise. There are some limitations of a survey too. First, people may give inaccurate information because of memory lapses or they may not want to let the researcher know what they really believe about a particular issue. Second, people sometimes offer responses they think the researcher wants to hear.

Psychological Testing

Assessment of individual differences has remained one of the important concerns of psychology from the very beginning. Psychologists have constructed different types of tests for assessment of various human characteristics, such as intelligence, aptitude, personality, interest, attitudes, values, educational achievement, etc. These tests are used for various purposes, such as personnel selection, placement, training, guidance, diagnosis, etc., in multiple contexts including educational institutions, guidance clinics, industries, defence establishments, and so forth. Have you ever taken a psychological test? If you have, you might have seen that a test contains a number of questions, called items, with their probable responses, which are related to a particular human characteristic or attribute. It is important here that the characteristic for which a test has been developed, should be defined clearly and unambiguously, and all items (questions) should be related to that characteristic only. You might also notice that often a test is meant for a particular age group. It may or may not have a fixed time limit for answering the questions.

Technically speaking, a psychological test is a **standardised** and **objective** instrument

which is used to assess an individual's standing in relation to others on some mental or behavioural characteristics. Two things are worth noting in this definition: objectivity and standardisation. **Objectivity** refers to the fact that if two or more researchers administer a psychological test on the same group of people, both of them would come up with more or less the same values for each person in the group. In order for a psychological test to become an objective measure, it is essential that items should be worded in such a manner that they communicate the same meaning to different readers. Also, the instructions to the test takers about how to answer the test items should be specified in advance. The procedure of administering the test such as environmental conditions, time limit, mode of administration (individual or group) should be spelt, and the procedure for scoring of the participants' responses need to be described.

The construction of a test is a systematic process and involves certain steps. It involves detailed analysis of items, and estimating **reliability**, **validity**, and **norms** of the whole test.

Reliability of the test refers to the consistency of scores obtained by an individual on the same test on two different occasions. For example, you administer the test to a group of students today and re-administer it on the same set of students after some time, let us say 20 days. If the test is reliable, there should not be any variation in the scores obtained by the students on the two occasions. For this, we can compute **test-retest** reliability, which indicates the temporal stability (or stability of the test scores over time). It is computed by finding out co-efficient of correlation between the two sets of scores on the same set of persons. Another kind of test reliability is called **split-half** reliability. It gives an indication about the degree of internal consistency of the test. This is based on the assumption that items of a test if they are from the same domain should correlate with each other. If they are from different domains, e.g., apples and oranges, then they would not. For finding out internal consistency, the test is divided into two equal halves employing odd-even method (items 1,3,5,— in one group and items 2,4,6,— in another group) and correlation is computed between the scores of odd and even items.

For a test to be usable, it should also be valid. **Validity** refers to the question : "Does the test measure what it claims to measure"? For example, if you have constructed a test of mathematics achievement, whether the test is measuring mathematical achievement or for example, language proficiency.

Finally, a test becomes a standardised test when **norms** are developed for the test. As mentioned earlier, norm is the normal or average performance of the group. The test is administered on a large number of students. Their average performance standards are set based on their age, sex, place of residence, etc. This helps us in comparing the performance of an individual student with others of the same group. It also helps in interpreting individuals' score obtained on a test.

Types of Tests

Psychological tests are classified on the basis of their language, mode of administration, and difficulty level. Depending upon the language, we have **verbal**, **non-verbal**, and **performance** tests. Literacy is required for taking verbal tests as the items have to be written in some language. In non-verbal tests, items are made of symbols or pictures. Performance tests require movement of objects from their respective places in a particular order.

Depending upon the mode of administration, psychological tests are divided into **individual** or **group** tests. An individual test is administered by the researcher to one person at a time, while group tests can be administered to large number of persons at the same time. In individual tests, the researcher administers the test face to face and remains seated before the test taker and notes down the responses. In the group test, the instructions about answering the items, etc., are written on the test, which the test

taker reads and answers the questions accordingly. The test administrator explains the instructions to the entire group. Individual tests are time consuming, but are important ways of getting responses from children, and from those who do not know the language. Group tests are easy to administer and are also less time consuming. However, the responses are fraught with certain limitations. The respondent may not be motivated enough to answer the questions and may give fake responses.

Psychological tests are also classified into **speed** and **power** tests. In a speed test, there is a time limit within which the test taker is required to answer all the items. Such a test evaluates the individual on the basis of time taken to answer the items accurately. In a speed test, all the items are of the same degree of difficulty. On the other hand, power test assesses the underlying ability (or power) of the individuals by allowing them sufficient time, i.e. these tests do not have any time limit. In a power test, the items are generally arranged in an increasing order of difficulty. If a person, for example, is unable to solve the 6th item, s/he will have difficulty in answering the subsequent items. It is, however, difficult to construct a pure speed or power test. Majority of the tests are a combination of both speed and power.

While tests are often used in research and for making decisions about people, tests must be selected and used with great care. The test user or the decision maker should not rely on any single test. Test data should be combined with information about a person's background, interests, and past performance.

Activity 2.4

Take a test with its manual and read it carefully, and identify the following :

- *Number and type of items*
- *Information about reliability, validity, and norms*
- *Type of test: verbal or otherwise, individual or group*
- *Type of test: Speed, power, or mixed*
- *Any other characteristics*

Discuss these with other students and the teacher.

Case Study

In this method, the emphasis is given on in-depth study of a particular case. Researchers focus on cases which can provide critical information or new learning on less understood phenomena. The case can be an individual with distinguishing characteristics (for example, a patient showing psychological disorders) or a small group of individuals having some commonality among them (for example, creative writers like Rabindra Nath Tagore, and Mahadevi Verma), institutions (for example, poorly or successfully functioning school or a corporate office), and specific events (for example, children exposed to devastation by tsunami, war or vehicular pollution, etc.). The cases that we select for study are unique and, therefore, are rich in information. A case study employs multiple methods for collecting information, such as interview, observation, and psychological tests from a variety of respondents who in some way or the other might be associated with the case and can provide useful information. With the help of case studies, psychologists have done research to understand feelings, fantasies, hopes, fears, traumatic experiences, parental upbringing and so on, that helps to understand a person's mind and behaviour. Case studies provide a narrative or detailed descriptions of the events that take place in a person's life.

A case study is a valuable research tool in the field of clinical psychology and human development. Freud's insights that led to the development of psychoanalytic theory emerged from his observations and showed that meticulous records must be maintained on individual cases. Similarly, Piaget developed his theory of cognitive development on the basis of observations of his three children. Case studies have been conducted to understand the pattern of socialisation of children. For example, Minturn and Hitchcock conducted a case study of socialisation of

children among *Rajputs* of Khalapur. S. Anandalakshmy studied aspects of childhood in a weavers' community in Varanasi.

Case studies provide detailed in-depth depictions of people's lives. However, while generalising on the basis of individual cases one needs to be very cautious. The problem of validity in a single case study is quite challenging. It is recommended that the information should be collected using multiple strategies from different sources of information by a number of investigators. Careful planning of data collection is also very necessary. Throughout the process of data collection the researcher is required to maintain a chain of evidence for linking various data sources having bearing on the research questions.

As you have read, each method has its own limitations and advantages. Therefore, it is desirable that the researcher should not depend upon only one method. A combination of two or more methods should be used to get the real picture. If the methods converge, i.e. they give the same results, one can certainly be more confident.

Activity 2.5

Identify the most appropriate method of enquiry for the following research problems.

- *Does noise influence the problem solving ability of the people?*
- *Should there be a dress code for college students?*
- *Studying the attitude of students, teachers, and parents towards homework.*
- *Studying the behaviour of a student in a playgroup and in a classroom.*
- *Tracing the major life events of your favourite leader.*
- *Assessing the anxiety level of Class XI students of your school.*

Analysis of Data

In the earlier section, we discussed different methods for collecting information. After data are collected, the next job of the researcher is to draw conclusions. This requires analysis of data. We generally use two methodological approaches for the analysis of data. These are: quantitative and qualitative methods. In this section, we will briefly discuss these approaches.

Quantitative Method

As you may have gathered by now, psychological tests, questionnaires, structured interviews, etc. contain a series of close-ended questions. That is, the questions and their probable responses are given in these measures. Generally, these responses are given in scaled forms. That is, they indicate the strength and magnitude of the response. For example, they may vary from 1 (low) to 5, 7 or 11 (high). The participants' task is to select the most appropriate response. Sometimes there are right and wrong responses. A researcher assigns a number to each answer (normally "1" for right answers, and "0" for wrong answers). At the end, the researcher calculates the total of all these numbers and arrives at an aggregate score, which tells about the participants' level on that particular attribute (for example, intelligence, academic intelligence, etc.). In doing so, the researcher converts the psychological attributes into a quantity (usually numbers).

For the purpose of drawing conclusions, a researcher may compare individual's score with that of the group, or compare the scores of two groups. This requires use of certain statistical methods about which you will study later. You have already read in mathematics in Class X about the methods of central tendency (mean, median, and mode), methods of variability (range, quartile deviation, standard deviation), co-efficients of correlation, and so forth. These and some other advanced statistical methods enable a researcher to make inferences and to give meaning to the data.

Qualitative Method

Human experiences are very complex. This complexity is lost when one elicits information

from a respondent on the basis of a question. If you want to know how a mother feels about the loss of her child, you will need to hear her story to understand how her experience is organised and what meaning she has given to her suffering. Any attempt at its quantification will not enable you to get at the principles of organising such experiences. Psychologists have developed various qualitative methods to analyse such data. One of them is Narrative Analysis. Also data are not always available in the form of scores. When the researcher uses the method of participant observation or unstructured interview, the data are generally in a descriptive form—in participants' own words, field notes taken by the researchers, photographs, interview responses noted by the researcher or taped/video-recorded, informal talks, etc. These type of data cannot be converted into scores or subjected to statistical analysis. Rather, the researcher uses the technique of content analysis to find out thematic categories and build those categories taking examples from the data. It is more descriptive in nature.

It must be understood that quantitative and qualitative methods are not contradictory; rather, they are complementary to each other. In order to understand a phenomenon in its totality, a suitable combination of both methods is warranted.

Limitations of Psychological Enquiry

The advantages and limitations of each method have been discussed earlier. In this section, you will read some general problems faced by psychological measurement.

1. *Lack of True Zero Point* : In physical sciences measurements do start from zero. For example, if you want to measure the length of the table, you can measure it starting from zero and can say it is 3' long. Psychological measurements do not have a true zero point. For example, no person in this world has zero intelligence. All of us have some degree of intelligence. What psychologists do is that they arbitrarily decide a point as zero point and proceed further. As a result, whatever scores we get in psychological studies, are not absolute in nature; rather, they have relative value.

   In some of the studies ranks are used as scores. For example, on the basis of marks obtained in some test, the teacher arranges the students in an order — 1, 2, 3, 4, … , and so on. The problem in such type of assessment is that the difference between first and second rank holders may not be the same as is the difference between the second and third rank holders. Out of 50, the first rank holder might score 48, the second 47, and the third 40. As you can see, the difference between the first and the second rank holders is not the same as is the case between second and third rank holders. This also illustrates the relative nature of the psychological measurement.

2. *Relative Nature of Psychological Tools* : Psychological tests are developed keeping in view the salient features of a particular context. For example, a test developed for urban students may contain items that demand familiarity with the stimuli available in the urban setting—multistoried buildings, airplanes, metro railway, etc. Such a test is not suitable for use with children living in tribal areas who would be more at ease with items that describe their flora and fauna. Similarly, a test developed in the Western countries may or may not be applicable in the Indian context. Such tests need to be properly modified and adapted keeping in view the characteristics of the context in which they are to be used.

3. *Subjective Interpretation of Qualitative Data* : Data from qualitative studies are largely subjective since they involve interpretation on the part of the researcher as well as the person providing data. The interpretations may vary from one individual to the other. It is, therefore, often suggested that in case of qualitative

studies, the field work should be done by more than one investigator, who at the end of the day should discuss their observations and arrive at an agreement before finally giving it a meaning. In fact, one is better off, if the respondents too are involved in such meaning-making process.

Ethical Issues

As you know, psychological research is concerned with human behaviour, the researcher is expected to follow certain ethics (or moral principles) while conducting the studies. These principles are: **respect for persons' privacy** and **choice to participate in the study**, **beneficence** or **protecting the participants in the study from any harm**, and **justice** or **sharing the benefits of research with all participants**. Some of the important aspects of these ethical principles are described as follows.

1. *Voluntary Participation* : This principle states that the persons on whom you want to conduct the study should have the choice to decide whether to participate or not to participate in the study. The participants should have the freedom to decide about their participation without any coercion or excessive inducement, and the freedom to withdraw from the research without penalty, once it has begun.
2. *Informed Consent* : It is essential that the participants in a study should understand what will happen to them during the study. The principle of informed consent states that potential participants must receive this information before data from them are collected, so that they make an informed decision about participation in the study. In some of the psychological experiments, electric shock is given to the participants during the experiment. Still in some cases obnoxious (e.g., harmful or unpleasant) stimuli are presented. They may at times be required to give some private information, which is generally not shared with others. In some studies, the technique of deception is used in which the participants are given instructions to think or imagine in certain ways and are given false information or feedback about their performance (for example, you are very intelligent, you are incompetent). It is, therefore, important that the participants are explained the nature of the study before its actual commencement.
3. *Debriefing* : Once the study is over, the participants are provided with necessary information to complete their understanding of research. This is particularly important if deception has been used in the study. Debriefing ensures that participants leave the study in the same physical and mental state as when they entered. It should offer reassurance to the participants. The researcher should make efforts to remove any anxiety or other adverse effects that participants may have felt as a result of being deceived in the course of the study.
4. *Sharing the Results of the Study* : In psychological research, after collecting information from the participants, we come back to our places of work, analyse the data and draw conclusions. It is obligatory for the researcher to go back to the participants and share the results of the study with them. When you go for data collection, the participants develop certain expectations from you. One of the expectations is that you will tell them about their behaviour that you have investigated in the study. As a researcher, it is our moral duty to go back to the participants. This exercise has two advantages. One, you fulfil the expectations of the participants. Second, the participants may tell you their opinion about the results, which sometimes may help you develop new insights.
5. *Confidentiality of Data Source* : The participants in a study have the right to privacy. The researcher must safeguard

their privacy by keeping the information provided by them in strict confidence. The information should only be used for research purposes and, in no circumstances, it should be passed on to other interested parties. The most effective way of protecting the confidentiality of participants is not to record their identities. This is, however, not possible in certain kinds of research. In such cases, code numbers are given on the data sheet, and the names with the codes are kept separately. The identification list should be destroyed as soon as the research is over.

Key Terms

Case study, Confidentiality, Control group, Correlational research, Data, Debriefing, Dependent variable, Experimental group, Experimental method, Group test, Hypothesis, Independent variable, Individual test, Interview, Negative correlation, Norms, Objectivity, Observation, Performance tests, Positive correlation, Power test, Psychological test, Qualitative method, Quantitative method, Questionnaire, Reliability, Speed test, Structured interview, Survey, Unstructured interview, Validity, Variable

Summary

- *A psychological research is conducted for the purpose of description, prediction, explanation, control of behaviour, and application of knowledge generated in an objective manner. It involves the following four steps: conceptualising a problem, collection of data, analysing data, drawing and revising research conclusions. The psychological research is also conducted to discover and understand the subjective meanings of events as they occur in a particular context, and also reflect upon one's own behaviour and experiences.*
- *In psychological studies, different types of data including demographic, environmental, physical, physiological, and psychological information are collected. However, the data in psychological studies remain located in a context and are tied to the theory and method used for its collection.*
- *Different methods are used for collecting information. The observation method is used for describing the behaviour. It is characterised by selection of a particular behaviour, its recording and analysis. Observation can be done in a naturalistic or controlled laboratory conditions. It can take the form of a participant or non-participant observation.*
- *The experimental method helps in establishing cause-effect relationship. The effect of the presence of independent variable on the dependent variable is studied using experimental and control groups.*
- *The purpose of correlational research is investigating association between variables as well as making predictions. The relationship between two variables can be positive, zero or negative, and strength of association varies from +1.0 through 0.0 to –1.0.*
- *The focus of survey research is to inform about the existing reality. Surveys can be conducted by using structured and unstructured interviews, mailed questionnaires, and telephone.*
- *The psychological tests are standardised and objective instruments which help in knowing one's standing in comparison to others. Tests can be verbal, non-verbal, and performance types, which can be administered individually or to the entire group at a time.*
- *The method of case study gives detailed in-depth information about a particular case.*
- *The data collected through the use of these methods are analysed through quantitative and qualitative methods. The quantitative methods allow the use of statistical procedure for drawing conclusions. Narrative method and method of content analysis are some methods that are used in case of qualitative research.*
- *Lack of absolute zero point, relative nature of psychological tools, and subjective interpretation of qualitative data are some of the limitations of psychological enquiry. Ethical principles of voluntary participation of the subjects, their informed consent, and sharing of results with the participants must be followed by a researcher.*

Review Questions

1. What are the goals of scientific enquiry?
2. Describe the various steps involved in conducting a scientific enquiry.
3. Explain the nature of psychological data.
4. How do experimental and control groups differ? Explain with the help of an example.
5. A researcher is studying the relationship between speed of cycling and the presence of people. Formulate a relevant hypothesis and identify the independent and dependent variables.
6. Discuss the strengths and weaknesses of experimental method as a method of enquiry.
7. Dr. Krishnan is going to observe and record children's play behaviour at a nursery school without attempting to influence or control the behaviour. Which method of research is involved? Explain the process and discuss its merits and demerits.
8. Give two examples of the situations where survey method can be used. What are the limitations of this method?
9. Differentiate between an interview and a questionnaire.
10. Explain the characteristics of a standardised test.
11. Describe the limitations of psychological enquiry.
12. What are the ethical guidelines that a psychologist needs to follow while conducting a psychological enquiry?

Project Ideas

1. Conduct a survey of the after-school activities of Class V and Class IX students taking a sample of 10 students in each. Find information about the time devoted by them in various activities, such as studying, playing, television viewing, hobbies, etc. Do you find any difference? What conclusions do you draw and what suggestions would you offer?
2. Conduct a study in your group to see the effect of recitation on learning of poetry. Take 10 six-year olds and divide them into two groups. Give group 1 a new poem to learn and instruct them to read it loudly for 15 minutes. Take group 2 and give them the same new poem to learn but instruct them not to read it loudly. After 15 minutes ask the two groups to recall. Care needs to be taken to see that both the groups are dealt with separately. After the recall has taken place, note down the observation.

   Identify what method of research you used, the hypothesis, the variables and the kind of experimental design that were there. Compare notes with the other groups and share the result with your teacher in the class.

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Chapter 3

The Bases of Human Behaviour

After reading this chapter, you would be able to

- understand the evolutionary nature of human behaviour,
- relate the functions of nervous system and endocrine system to behaviour,
- explain the role of genetic factors in determining behaviour,
- understand the role of culture in shaping human behaviour,
- describe the processes of enculturation, socialisation, and acculturation, and
- relate biological and socio-cultural factors in understanding human behaviour.

There are one hundred and ninety-three species of monkeys and apes. One-hundred and ninety-two of them are covered with hair. The exception is the naked ape self-named, homo-sapiens.

– Desmond Morris

Contents

Introduction
Evolutionary Perspective
Biological and Cultural Roots
Biological Basis of Behaviour
Neurons
Structure and Functions of Nervous System and Endocrine System and their Relationship with Behaviour and Experience
The Nervous System
The Endocrine System
Heredity: Genes and Behaviour
Cultural Basis : Socio-Cultural Shaping of Behaviour
Concept of Culture
Biological and Cultural Transmission (Box 3.1)
Enculturation
Socialisation
Acculturation

Key Terms
Summary
Review Questions
Project Ideas

Introduction

Human beings, the homo sapiens, are the most developed organisms among all creatures on this earth. Their ability to walk upright, larger brain size relative to body weight, and the proportion of specialised brain tissues make them distinct from other species. These features have evolved through millions of years and have enabled them to engage in several complex behaviours. Scientists have attempted to study the relationship of complex human behaviour with the processes of the nervous system, particularly the brain. They have tried to discover the neural basis of thoughts, feelings, and actions. By understanding the biological aspects of human beings, you will be able to appreciate how the brain, environment and behaviour interact to generate unique forms of behaviour. In this chapter, we begin with a general description of the nervous system in an evolutionary perspective. You will also study the structure and functions of the nervous system. You will learn about the endocrine system, and its influence on human behaviour. Later in this chapter, you will also study the notion of culture and show its relevance to the understanding of behaviour. This will be followed by an analysis of the processes of enculturation, socialisation, and acculturation.

Evolutionary Perspective

You must have observed that people differ with respect to their physical and psychological characteristics. The uniqueness of individuals results from the interaction of their genetic endowments and environmental demands.

In this world, there are millions of different species of organisms differing in a variety of ways. Biologists believe that these species were not always like this; they have evolved to their present form from their pre-existing forms. It is estimated that the characteristics of modern human beings developed some 2,00,000 years ago as a result of their continuous interaction with the environment.

Evolution refers to gradual and orderly biological changes that result in a species from their pre-existing forms in response to the changing adaptational demands of their environment. Physiological as well as behavioural changes that occur due to the evolutionary process are so slow that they become visible after hundreds of generations. Evolution occurs through the process of natural selection. You know that members of each species vary greatly in their physical structure and behaviour. The traits or characteristics that are associated with high rate of survival and reproduction of those species are the most likely ones to be passed on to the next generations. When repeated generation after generation, natural selection leads to the evolution of new species that are more effectively adapted to their particular environment. This is very similar to the selective breeding of horses or other animals these days. Breeders select the fittest and the fastest male and female horses from their stock, and promote them for selective breeding so that they can get the fittest horses. Fitness is the ability of an organism to survive and contribute its genes to the next generation.

Three important features of modern human beings differentiate them from their ancestors: (i) a bigger and developed brain with increased capacity for cognitive behaviours like perception, memory, reasoning, problem solving, and use of language for communication, (ii) ability to walk upright on

two legs, and (iii) a free hand with a workable opposing thumb. These features have been with us for several thousand years.

Our behaviours are highly complex and more developed than those of other species because we have got a large and highly developed brain. Human brain development is evidenced by two facts. Firstly, the weight of the brain is about 2.35 per cent of the total body weight, and it is the highest among all species (in elephant it is 0.2 per cent). Secondly, the human cerebrum is more evolved than other parts of the brain.

These evolutions have resulted due to the influence of environmental demands. Some behaviours play an obvious role in evolution. For example, the ability to find food, avoid predators, and defend one's young are the objectives related to the survival of the organisms as well as their species. The biological and behavioural qualities, which are helpful in meeting these objectives, increase an organism's ability to pass it on to the future generation through its genes. The environmental demands lead to biological and behavioural changes over a long period of time.

Biological and Cultural Roots

An important determinant of our behaviour is the biological structures that we have inherited from our ancestors in the form of developed body and brain. The importance of such a biological bases becomes obvious when we observe cases in which brain cells have been destroyed by any disease, use of drug or an accident. Such cases develop various kinds of physical and behavioural disabilities. Many children develop mental retardation and other abnormal symptoms due to transmission of a faulty gene from the parents.

As human beings, we not only share a biological system, but also certain cultural systems. These systems are quite varied across human populations. All of us negotiate our lives with the culture in which we are born and brought up. Culture provides us with different experiences and opportunities of learning by putting us in a variety of situations or placing different demands on our lives. Such experiences, opportunities and demands also influence our behaviour considerably. These influences become more potent and visible as we move from infancy to later years of life. Thus, besides biological bases, there are cultural bases of behaviour also. You will learn about the role of culture in behaviour at a later point in this chapter.

Biological Basis of Behaviour

Neurons

Neuron is the basic unit of our nervous system. Neurons are specialised cells, which possess the unique property of converting various forms of stimuli into electrical impulses. They are also specialised for reception, conduction and transmission of information in the form of electrochemical signals. They receive information from sense organs or from other adjacent neurons, carry them to the central nervous system (brain and spinal cord), and bring motor information from the central nervous system to the motor organs (muscles and glands).

Nearly 12 billion neurons are found in the human nervous system. They are of many types and vary considerably in shape, size, chemical composition, and function. Despite these differences, they share three fundamental components, i.e. soma, dendrites, and axon.

The **soma** or cell body is the main body of the nerve cell. It contains the **nucleus** of the cell as well as other structures common to living cells of all types (Figure 3.1). The genetic material of the neuron is stored inside the nucleus and it becomes actively engaged during cell reproduction and protein synthesis. The soma also contains most of the cytoplasm (cell-fluid) of the neuron. **Dendrites** are the branch-like specialised structures emanating from the soma. They are the receiving ends of a neuron. Their function is to receive the incoming neural impulses from adjacent neurons or directly from the sense organs. On dendrites are found specialised receptors, which become active

when a signal arrives in electrochemical or biochemical form. The received signals are passed on to soma and then to axon so that the information is relayed to another neuron or to muscles. The axon conducts the information along its length, which can be several feet in the spinal cord and less than a millimeter in the brain. At the terminal point the axon branches into small structures, called **terminal buttons**. These buttons have the capability for transmitting information to another neuron, gland and muscle. Neurons generally conduct information in one direction, that is, from the dendrites through soma and axon to the terminal buttons.

The conduction of information from one place to another in the nervous system is done through nerves, which are bundles of **axons**. Nerves are mainly of two types: *sensory* and *motor*. Sensory nerves, also called afferent nerves, carry information from sense organs to central nervous system. On the other hand, motor nerves, also called efferent nerves, carry information from central nervous system to muscles or glands. A motor nerve conducts neural commands which direct, control, and regulates our movements and other responses. There are some mixed nerves also, but sensory and motor fibers in these nerves are separate.

Nerve Impulse

Information travels within the nervous system in the form of a nerve impulse. When stimulus energy comes into contact with receptors, electrical changes in the nerve potential start. Nerve potential is a sudden change in the electrical potential of the surface of a neuron. When the stimulus energy is relatively weak, the electrical changes are so small that the nerve impulse is not generated, and we do not feel that stimulus. If the stimulus energy is relatively strong, electrical impulses are generated and conducted towards the central nervous system. The strength of the nerve impulse, however, does not depend on the strength of the stimulus that started the impulse. The nerve fibers work according to the "**all or none principle**", which means that they either respond completely or do not respond at all. The strength of the nerve impulse remains constant along the nerve fiber.

Synapse

Information is transmitted from one place to another within the nervous system in the form of a neural impulse. A single neuron can carry a neural impulse up to a distance covered by the length of its axon. When the impulse is to be conducted to a distant part of the body, a number of neurons participate in the process. In this process, one neuron faithfully relays the information to a neighboring neuron. The axon tip of a preceding neuron make functional connections or *synapse* with dendrites of the other neuron. A neuron is

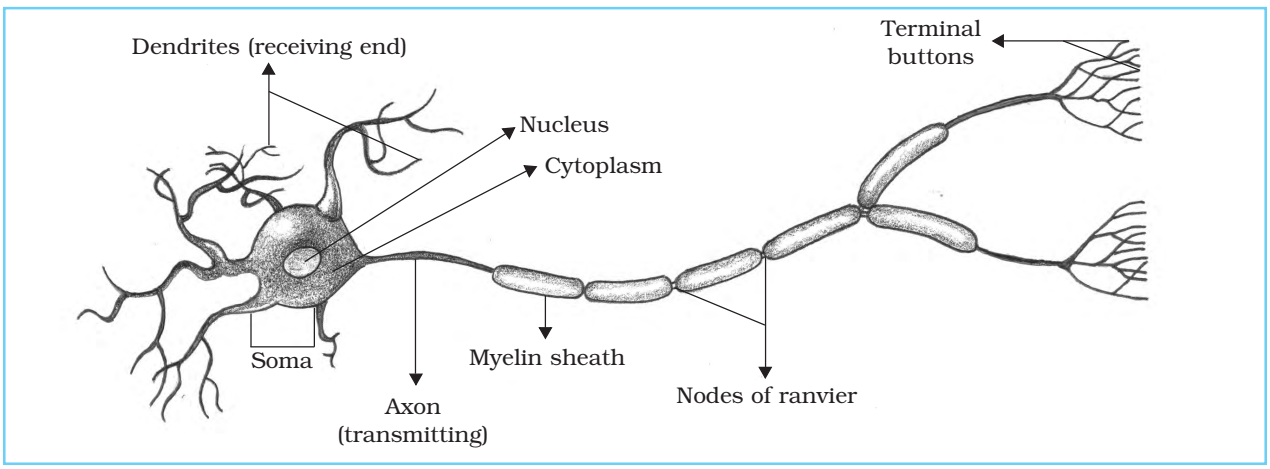

Fig.3.1 : The Structure of Neuron

never physically connected with another neuron; rather there is a small gap between the two. This gap is known as synaptic cleft. The neural impulse from one neuron is transmitted by a complex synaptic transmission process to another neuron. The conduction of neural impulse in the axon is electrochemical, while the nature of synaptic transmission is chemical (Figure 3.2). The chemical substances are known as neurotransmitters.

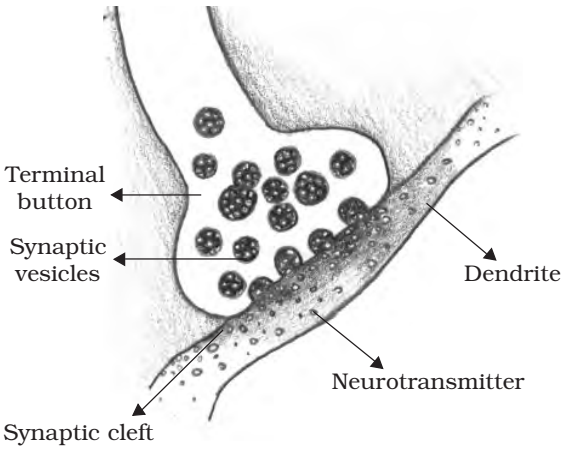

Fig.3.2 : Transmission of Nerve Impulse through Synapse

Structure and Functions of Nervous System and Endocrine System and their Relationship with Behaviour and Experience

Since our biological structures play an important role in organisation and execution of behaviour, we shall look at these structures in some detail. In particular, you will read about the nervous system and the endocrine system, which work together in giving a shape to human behaviour and experience.

The Nervous System

Human nervous system is the most complex and most developed of all living creatures. Though the nervous system functions as a whole, for the ease of study, we can divide it into many parts depending on its location or functions. Based on location, the nervous system can be divided into two parts: Central Nervous System (CNS) and Peripheral Nervous System (PNS). The part of the nervous system found inside the hard bony cases (cranium and backbone) is classified as CNS. Brain and spinal cord are the organs of this system. The parts of the nervous system other than central nervous system are placed in the PNS. PNS can be further classified into Somatic and Autonomic nervous system. Somatic nervous system is concerned with voluntary actions, while the autonomic nervous system performs functions on which we have no voluntary control. The organisation of the nervous system is schematically presented in Figure 3.3.

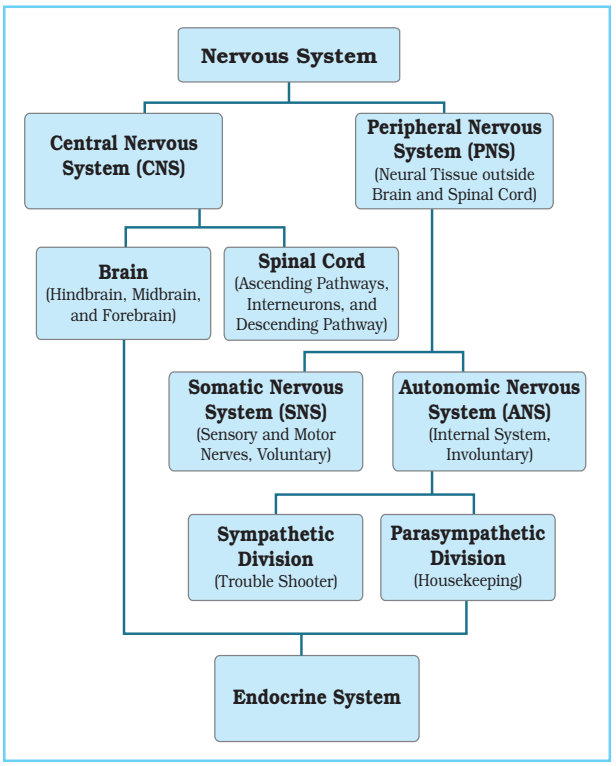

Fig.3.3 : Schematic Representation of the Nervous System

The Peripheral Nervous System

The PNS is composed of all the neurons and nerve fibers that connect the CNS to the rest of the body. The PNS is divided into Somatic Nervous System and Autonomic Nervous System. The autonomic nervous system is

further divided into Sympathetic and Parasympathetic systems. The PNS provides information to the CNS from sensory receptors (eyes, ears, skin, etc.) and relays back motor commands from the brain to the muscles and glands.

The Somatic Nervous System

This system consists of two types of nerves, called cranial nerves and spinal nerves. There are twelve sets of cranial nerves which either emanate from or reach different locations of the brain. There are three types of cranial nerves - sensory, motor, and mixed. Sensory nerves collect sensory information from receptors of the head region (vision, audition, smell, taste, touch, etc.) and carry them to the brain. The motor nerves carry motor impulses originating from the brain to muscles of the head region. For example, movements of the eyeballs are controlled by motor cranial nerves. Mixed nerves have both sensory and motor fibers, which conduct sensory and motor information to and from the brain.

There are thirty one sets of spinal nerves coming out of or reaching to the spinal cord. Each set has sensory and motor nerves. Spinal nerves have two functions. The sensory fibers of the spinal nerves collect sensory information from all over the body (except the head region) and send them to the spinal cord from where they are then carried out to the brain. In addition, motor impulses coming down from the brain are sent to the muscles by the motor fibers of the spinal nerves.

The Autonomic Nervous System

This system governs activities which are normally not under direct control of individuals. It controls such internal functions as breathing, blood circulation, salivation, stomach contraction, and emotional reactions (Figure 3.4). These activities of the autonomic system are under the control of different structures of the brain.

The Autonomic Nervous System has two divisions: Sympathetic division and Parasympathetic division. Although the effect

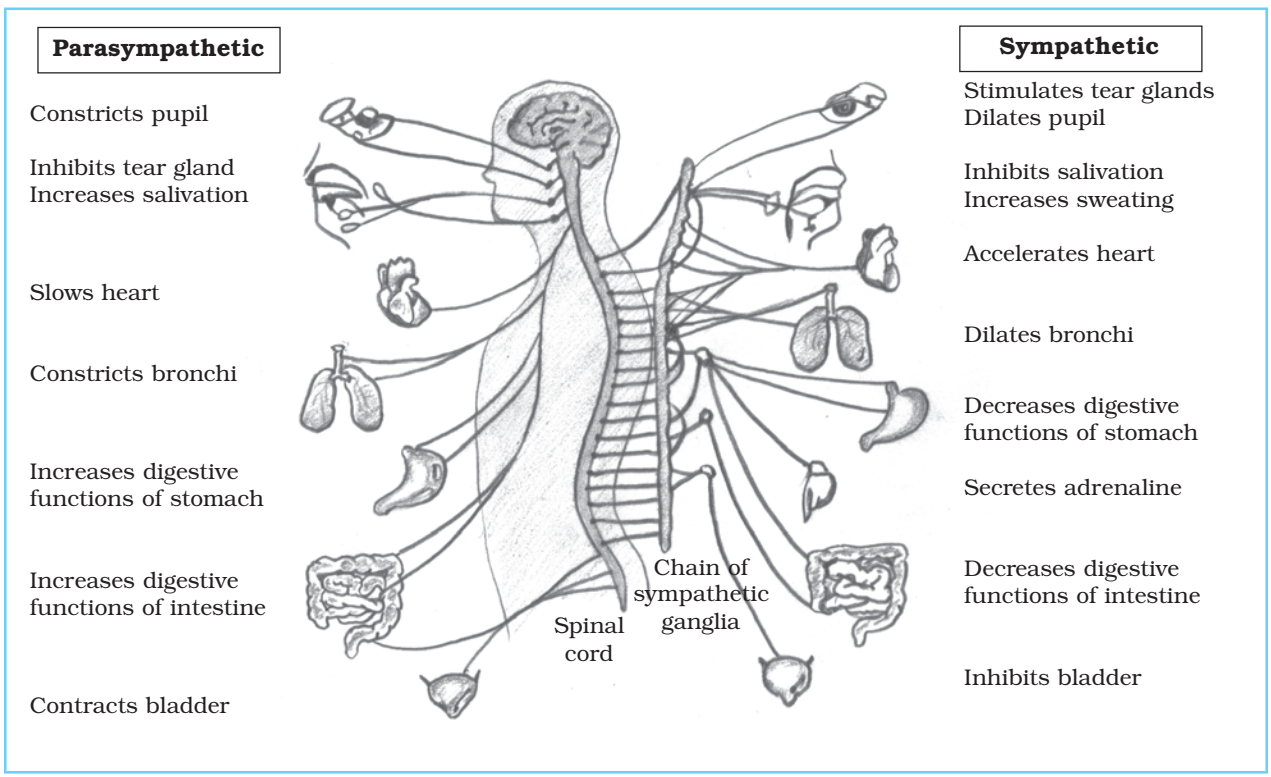

Fig.3.4 : The Functions of the Autonomic Nervous System

of one division is opposite to the effect of the other, both work together to maintain a state of equilibrium. The sympathetic division deals with emergencies when the action must be quick and powerful, such as in situations of fight or flight. During this period, the digestion stops, blood flows from internal organs to the muscles, and breathing rate, oxygen supply, heart rate, and blood sugar level increases.

The Parasympathetic division is mainly concerned with conservation of energy. It monitors the routine functions of the internal system of the body. When the emergency is over, the parasympathetic division takes over; it decelerates the sympathetic activation and calms down the individual to a normal condition. As a result all body functions like heart beat, breathing, and blood flow return to their normal levels.

The Central Nervous System

The central nervous system (CNS) is the centre of all neural activity. It integrates all incoming sensory information, performs all kinds of cognitive activities, and issues motor commands to muscles and glands. The CNS comprises of the (a) brain and (b) spinal cord. You will now read about the functions of the major parts of the brain and for what behaviours is each part responsible.

The Brain and Behaviour

It is believed that the human brain has evolved over millions of years from the brains of lower animals, and this evolutionary process still continues. We can examine the levels of structures in the brain, from its earliest to the most recent form in the process of evolution. The limbic system, brain stem and cerebellum are the oldest structures, while Cerebral Cortex is the latest development in the course of evolution. An adult brain weighs about 1.36 kg and contains around 100 billion neurons. However, the most amazing thing about the brain is not its number of neurons but its ability to guide human behaviour and thought. The brain is organised into structures and regions that perform specific functions. Brain scanning reveals that while some mental functions are distributed among different areas of the brain, many activities are localised also. For example, the occipital lobe of the brain is a specialised area for vision.

Activity 3.1

Ask some students to make small slips of paper and write names of the parts of the nervous system on them. Put the slips together in a bowl and ask the students from the class to pick one slip each. Give them a few minutes and ask them to learn the location and function of the part mentioned in the slip. Each student is to then come forward and introduce him/herself as that part and explain the location and functions of that part.

Structure of the Brain

For the convenience of study, the brain can be divided into three parts: Hindbrain, Midbrain and Forebrain (Figure 3.5).

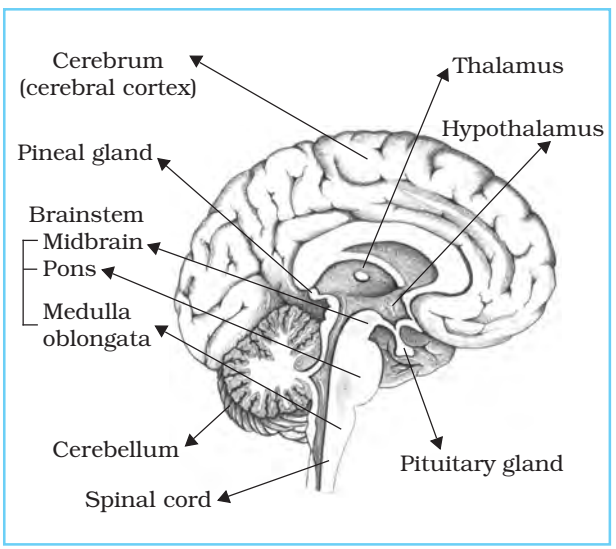

Fig.3.5 : Structure of the Brain

Hindbrain

This part of the brain consists of the following structures:

Medulla Oblongata : It is the lowest part of the brain that exists in continuation of the spinal cord. It contains neural centres, which

regulate basic life supporting activities like breathing, heart rate, and blood pressure. This is why medulla is known as the vital centre of the brain. It has some centres of autonomic activities also.

Pons : It is connected with medulla on one side and with the midbrain on the other. A nucleus (neural centre) of pons receives auditory signals relayed by our ears. It is believed that pons is involved in sleep mechanism, particularly the sleep characterised by dreaming. It contains nuclei affecting respiratory movement and facial expressions also.

Cerebellum : This highly developed part of the hindbrain can be easily recognised by its wrinkled surface. It maintains and controls posture and equilibrium of the body. Its main function is coordination of muscular movements. Though the motor commands originate in the forebrain, the cerebellum receives and coordinates them to relay to the muscles. It also stores the memory of movement patterns so that we do not have to concentrate on how to walk, dance, or ride a bicycle.

Midbrain

The midbrain is relatively small in size and it connects the hindbrain with the forebrain. A few neural centres related to some special reflexes and visual and auditory sensations are found here. An important part of midbrain, known as **Reticular Activating System** (RAS), is responsible for our arousal. It makes us alert and active by regulating sensory inputs. It also helps us in selecting information from the environment.

Forebrain

It is considered to be the most important part of the brain because it performs all cognitive, emotional, and motor activities. We will discuss four major parts of the forebrain: hypothalamus, thalamus, limbic system, and cerebrum.

Hypothalamus : The hypothalamus is one of the smallest structures in the brain, but plays a vital role in our behaviour. It regulates physiological processes involved in emotional and motivational behaviour, such as eating, drinking, sleeping, temperature regulation, and sexual arousal. It also regulates and controls the internal environment of the body (e.g., heart rate, blood pressure, temperature) and regulates the secretion of hormones from various endocrine glands.

Thalamus : It consists of an egg-shaped cluster of neurons situated on the ventral (upper) side of the hypothalamus. It is like a relay station that receives all incoming sensory signals from sense organs and sends them to appropriate parts of the cortex for processing. It also receives all outgoing motor signals coming from the cortex and sends them to appropriate parts of the body.

The Limbic System : This system is composed of a group of structures that form part of the old mammalian brain. It helps in maintaining internal homeostasis by regulating body temperature, blood pressure, and blood sugar level. It has close links with the hypothalamus. Besides hypothalamus, the limbic system comprises the Hippocampus and Amygdala. The hippocampus plays an important role in long-term memory. The amygdala plays an important role in emotional behaviour.

The Cerebrum : Also known as **Cerebral Cortex**, this part regulates all higher levels of cognitive functions, such as attention, perception, learning, memory, language behaviour, reasoning, and problem solving. The cerebrum makes two-third of the total mass of the human brain. Its thickness varies from 1.5 mm to 4 mm, which covers the entire surface of the brain and contains neurons, neural nets, and bundles of axons. All these make it possible for us to perform organised actions and create images, symbols, associations, and memories.

The cerebrum is divided into two symmetrical halves, called the Cerebral Hemispheres. Although the two hemispheres appear identical, functionally one hemisphere usually dominates the other. For example, the left hemisphere usually controls language

behaviour. The right hemisphere is usually specialised to deal with images, spatial relationships, and pattern recognition. These two hemispheres are connected by a white bundle of myelinated fibers, called Corpus Callosum that carries messages back and forth between the hemispheres.

Cerebral cortex has also been divided into four lobes - Frontal lobe, Parietal lobe, Temporal lobe, and Occipital lobe. The **Frontal lobe** is mainly concerned with cognitive functions, such as attention, thinking, memory, learning, and reasoning, but it also exerts inhibitory effects on autonomic and emotional responses. The **Parietal lobe** is mainly concerned with cutaneous sensations and their coordination with visual and auditory sensations. The **Temporal lobe** is primarily concerned with the processing of auditory information. Memory for symbolic sounds and words resides here. Understanding of speech and written language depends on this lobe. The **Occipital lobe** is mainly concerned with visual information. It is believed that interpretation of visual impulses, memory for visual stimuli and colour visual orientation is performed by this lobe.

Physiologists and psychologists have tried to identify specific functions associated with specific brain structures. They have found that no activity of the brain is performed only by a single part of the cortex. Normally, other parts are involved, but it is also correct that there is some localisation of functions, i.e. for a particular function, a particular part of the cortex plays a more important role than the other parts. For example, if you are driving a car, you see the road and other vehicles by the function of your occipital lobe, hear the horns by the function of your temporal lobe, do many motor activities controlled by parietal lobe, and make decisions by the help of frontal lobe. The whole brain acts as a well coordinated unit in which different parts contribute their functions separately.

Spinal Cord

The spinal cord is a long rope-like collection of nerve fibers, which run along the full length inside the spine. Its one end is connected with the medulla of the brain and another is free at the tail end. Its structure all along its length is similar. The butterfly shaped mass of grey matter present in the centre of the spinal cord contains **association neurons** and other cells. Surrounding the grey matter is the white matter of the spinal cord, which is composed of the ascending and descending neural tracts. These tracts (collections of nerve fibers) connect the brain with the rest of the body. The spinal cord plays the role of a huge cable, which exchanges innumerable messages with the CNS. There are two main functions of the spinal cord. Firstly, it carries sensory impulses coming from the lower parts of the body to the brain; and motor impulses originating from the brain to all over the body. Secondly, it performs some simple reflexes that do not involve the brain. Simple reflexes involve a sensory nerve, a motor nerve, and the association neurons of the grey matter of the spinal cord.

Reflex Action

A reflex is an involuntary action that occurs very quickly after its specific kind of stimulation. The reflex action takes place automatically without conscious decision of the brain. Reflex actions are inherited in our nervous system through evolutionary processes, for example, the eye-blinking reflex. Whenever any object suddenly comes near our eyes, our eyelids blink. Reflexes serve to protect the organism from potential threats and preserve life. Though several reflex actions are performed by our nervous system, the familiar reflexes are the knee jerk, pupil constriction, pulling away from very hot or cold objects, breathing and stretching. Most reflex actions are carried out by the spinal cord and do not involve the brain.

The Endocrine System

The endocrine glands play a crucial role in our development and behaviour. They secrete specific chemical substances, called hormones, which control some of our

behaviours. These glands are called ductless glands or endocrine glands, because they do not have any duct (unlike other glands) to send their secretions to specific places. Hormones are circulated by the bloodstream. The endocrine glands form the endocrine system of the body. This system works in conjunction with different parts of the nervous system. The whole system is thus known as neuroendocrine system. Figure 3.6 shows the major endocrine glands of the body.

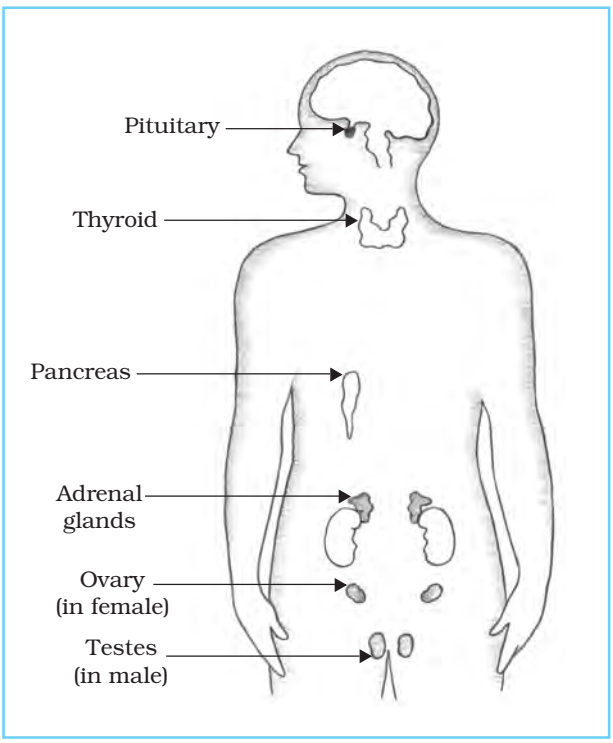

Fig.3.6 : Major Endocrine Glands

Pituitary Gland

This gland is situated within the cranium just below the hypothalamus. The pituitary gland is divided into anterior pituitary and posterior pituitary. The anterior pituitary is directly connected with hypothalamus, which regulates its hormonal secretions. The pituitary gland secretes the growth hormone and many other hormones, which direct and regulate the secretions of many other endocrine glands found in our body. This is why the pituitary gland is known as the "master gland".

Some hormones are secreted at a steady rate throughout life, while others are secreted at an appropriate time in life. For example, the growth hormone is released steadily through childhood, with some spurt during adolescence, but gonadotropic hormones are secreted at the age of puberty, which stimulates the secretion of appropriate sex hormones among boys and girls. As a result, primary and secondary sexual changes take place.

Thyroid Gland

This gland is located in the neck. It produces **thyroxin** that influences the body's metabolic rate. Optimum amount of thyroxin is secreted and regulated by an anterior pituitary hormone, the Thyroid Stimulating Hormone. (TSH). The steady secretion of this hormone maintains the production of energy, consumption of oxygen and elimination of wastes in body cells. On the other hand, underproduction of thyroxin leads to physical and psychological lethargy. If thyroid gland is removed in young animals, their growth is stunted and they fail to develop sexually.

Adrenal Gland

This gland is located above each kidney. It has two parts, **adrenal cortex** and **adrenal medulla**, each secreting different hormones. The secretion of adrenal cortex is controlled and regulated by Adrenocorticotrophic Hormone (ACTH) secreted by anterior pituitary gland. When the secretion of adrenal cortex goes down, anterior pituitary gets the message and increases the secretion of ACTH, which stimulates the adrenal cortex to secrete more hormones.

The adrenal cortex secretes a group of hormones, called **corticoids**, which are utilised by the body for a number of physiological purposes, e.g., regulation of minerals in the body, particularly sodium, potassium, and chlorides. Any disturbance in its function seriously affects the functions of the nervous system.

Adrenal medulla secretes two hormones, namely **epinephrine** and **norepinephrine** (also known as adrenaline and noradrenaline, respectively). Sympathetic activation, such as increased heart rate, oxygen consumption, metabolic rate, muscle tone, etc., take place through the secretion of these two hormones. Epinephrine and norepinephrine stimulate the hypothalamus, which prolongs emotions in an individual even when the stressor has been removed.

Pancreas

The pancreas, lying near the stomach, has a primary role in digestion of food, but it also secretes a hormone known as **insulin**. Insulin helps the liver to break down glucose for use by the body or for storage as glycogen by the liver. When insulin is not secreted in proper amount, people develop a disease, called diabetic mellitus or simply diabetes.

Gonads

Gonads refer to testes in males and ovaries in females. The hormones secreted by these glands control and regulate sexual behaviours and reproductive functions of males and females. Secretion of hormones of these glands is initiated, maintained and regulated by a hormone, called **gonadotrophic hormone** (GTH) secreted by the anterior pituitary. The secretion of GTH starts at the age of puberty (10 to 14 years in human beings) and stimulates gonads to secrete hormones, which in turn stimulates development of primary and secondary sexual characteristics.

The ovaries in females produce estrogens and progesterone. Estrogens guide the sexual development of the female body. Primary sexual characteristics related with reproduction, such as development of ovum or egg cell, appear on every 28 days or so in the ovary of a sexually mature female. Secondary sexual characteristics, such as breast development, rounded body contours, widened pelvis, etc., also depend on this hormone. Progesterone has no role in sexual development. Its function is related with preparation of uterus for the possible reception of fertilised ovum.

The hormonal system for reproductive behaviour is much simpler in the male because there is no cyclic pattern. Testes in males produce sperm continuously and secrete male sex hormones called androgens. The major androgen is testosterone. Testosterone prompts secondary sexual changes such as physical changes, growth of facial and body hairs, deepening of voice, and increase in sexually oriented behaviour. Increased aggression and other behaviours are also linked with testosterone production.

The normal functioning of all hormones is crucial to our behavioural well-being. Without a balanced secretion of hormones, the body would be unable to maintain the state of internal equilibrium. Without the increased secretion of hormones during the times of stress, we would not be able to react effectively to potential dangers in our environment. Finally, without the secretion of hormones at specific times in our lives, we would not be able to grow, mature and reproduce.

Heredity : Genes and Behaviour

We inherit characteristics from our parents in the form of genes. A child at birth possesses a unique combination of genes received from both parents. This inheritance provides a distinct biological blueprint and timetable for an individual's development. The study of the inheritance of physical and psychological characteristics from ancestors is referred to as **genetics**. The child begins life as a single zygote cell (mother's ovum fertilised by father's sperm). Zygote is a tiny cell with a nucleus in its center containing chromosomes. These chromosomes with all genes are inherited from each parent in equal numbers.

Chromosomes

Chromosomes are the hereditary elements of the body. They are threadlike-paired structures in the nucleus of each cell. The number of chromosomes per nucleus is

distinctive, and is constant for each living organism. The gametic cells (sperm and ovum) have 23 chromosomes but not in pairs. A new generation results from the fusion of a sperm cell and an egg cell.

At the time of conception, the organism inherits 46 chromosomes from parents, 23 from the mother and 23 from the father. Each of these chromosomes contains thousands of genes. However, the sperm cell (fathers') differs from the egg cell (mother's) in one important respect. The 23rd chromosome of the sperm cell can be either the capital X or Y type of the English alphabet. If the X type sperm fertilises the egg cell, the fertilised egg will have an XX 23rd chromosome pair, and the child will be a female. On the other hand, if a Y type sperm fertilises the egg, the 23rd chromosome pair will be XY, and the child will be a male.

Chromosomes are composed mainly of a substance called **Deoxyribonucleic Acid** (DNA). Our genes are composed chiefly of DNA molecules. The two genes that control the development of each trait are situated at the same locus, one on each chromosome of a particular pair. The exception is the sex chromosomes, i.e. the pair of chromosomes that determines an individual's sex.

Activity 3.2

Divide the class in two groups and have a debate on the topic "Psychologists should leave the study of neurons, synapses and the nervous system to biologists". One group should speak in favour and the other group against the motion.

Genes

Every chromosome stores thousands of genetic commands in the form of genes. These genes dictate much of the course of an organism's development. They contain instructions for the production of specific proteins, which regulate the body's physiological processes and the expression of phenotypic traits. The observable traits of an organism are called phenotype (e.g., body built, physical strength, intelligence, and other behavioural traits). The traits, which can be passed on to the offspring through genetic material are called its genotype. All biological and psychological characteristics that a modern man possesses are the result of genotype inheritance with phenotypical variations.

A given gene can exist in several different forms. Change of a gene from one form to another is called **mutation**. The type of mutation that occurs spontaneously in nature provides variation in genotypes and permits the evolution of new species. Mutation permits recombination of new genes with the genes already present. This new combination of genes structure is then put to test in the environment, which can select out those genotypes that turn out to be best fitted for the environment.

Cultural Basis : Socio-Cultural Shaping of Behaviour

After reading the biological basis of behaviour you may have developed an idea that many of our behaviours are influenced by hormones and many others occur as reflexive responses. However, hormones and reflexes do not explain all of our behaviour. The hormones play an important role in regulating human physiology, but they do not completely control human behaviour. Similarly stereotype (fixed pattern), which is the most distinguishing feature of a reflex, does not appear with most human responses.

We can draw examples from several domains of our life to argue that our behaviour is more complex than the behaviour of animals. A major reason for this complexity is that unlike animals, human beings have a culture to regulate their behaviour. Let us consider the basic need of hunger. We know that it has a biological basis, which is common among animals and human beings, but the way this need is gratified by human beings is extremely complex. For example, some people eat vegetarian food, while others eat non-vegetarian food. How have they become vegetarians and non-vegetarians? Some vegetarians take eggs; others do not. Why is

that so? Try to think how people have come to behave so differently in terms of food intake. If you explore further you will also find variations in the manner in which food is eaten (e.g., directly with hand, or with the help of spoons, forks and knives).

Sexual behaviour can be taken as another example. We know that this behaviour involves hormones and reflexive reactions in animals and human beings alike. While among animals sexual behaviour is fairly simple and reflexive (all animals indulge in sexual behaviour almost in the same manner), it is so complex among human beings that it can hardly be described as reflexive. Partner preferences are a key feature of human sexual behaviour. The bases of these preferences widely differ within and across societies. Human sexual behaviour is also governed by many rules, standards, values, and laws. However, these rules and standards also remain in a continuous process of change.

These examples illustrate that biological factors alone cannot help us very much in understanding human behaviour. The nature of human beings is very different from those provided to us by biological scientists. Human nature has evolved through an interplay of biological and cultural forces. These forces have made us similar in many ways and different in others.

Concept of Culture

You have read that human behaviour can be understood only by viewing it in the

Box 3.1 Biological and Cultural Transmission

In relatively modern years, a discipline called sociobiology has emerged that deals with the interaction of biology and society. It explains human social behaviour in an evolutionary framework on the basis of "inclusive fitness", which means that each organism is supposed to behave in a manner so as to maximise its reproductive success. Researchers, who have studied several social behaviours (e.g., courtship, mating, child rearing), underscore the continuity of development of biologically related creatures. They recognise that human behaviour cannot be attributed solely to biological predispositions. It is greatly affected by learning. Heidi Keller, a distinguished psychologist, recently argued that genetic endowment should not be misunderstood as expressing fixed, deterministic relationships between genes and behaviour. She has proposed the notion of "genetic preparedness", which suggests that acquisition of particular behaviours via learning occurs in fairly efficient ways to facilitate our adaptations with the environment.

It is now believed that human evolution involves both genetic and cultural transmissions. These transmission processes are different in certain respects, but they have parallel features. Genetic transmission is a process that occurs in all organisms in a similar manner, but cultural transmission is a unique human process. It involves intergenerational learning (via teaching and imitation), which makes it distinct from biological transmission. In cultural transmission, individuals are influenced by people other than their biological parents, while in biological transmission only the parents can be the source of influence. Thus, only human beings have "cultural parents" (e.g., members of extended families, teachers, and other influential people). Cultural evolution is also not restricted to intergenerational influences. Ideas are transmitted within generations so much so that it is even possible for older people to model their behaviour after younger ones.

The two processes are also similar in important ways. Both proceed in interaction with the demands of environment. Both involve changes that either stay or get lost depending on how adaptive they are (i.e., how nicely they fit the environment in which they first occurred). Thus, at the human level, we find evidence for a "dual inheritance" theory. Biological inheritance takes place through genes, while cultural inheritance takes place through memes. The former takes place in a "top-down" manner (i.e. from parents to children), while the latter may also take place in a "bottom-up" manner (i.e. from children to parents). Dual inheritance theory also shows that although biological and cultural forces may involve different processes, they work as parallel forces, and interact with each other in offering explanation of an individual's behaviour.

socio-cultural context in which it occurs. Human behaviour is fundamentally social. It involves relationships with other people, reactions to their behaviour, and engagement with innumerable products made available to us by our predecessors. Although many other species are also social like us, human beings are cultural as well.

You may ask: what does it mean to be cultural? In order to answer this question, we will need to understand the meaning of culture. In the simplest terms, culture refers to "the man-made part of the environment". It comprises diverse products of the behaviour of many people, including ourselves. These products can be material objects (e.g., tools, sculptures), ideas (e.g., categories, norms) or social institutions (e.g., family, school). We find them almost everywhere. They influence behaviour, although we may not always be aware of it.

Let us look at some examples. The room you might be in now is a cultural product. It is the result of someone's architectural ideas and building skills. Your room may be rectangular, but there are many places where rooms are not rectangular (e.g., those of Eskimos). While reading this chapter you might be sitting on a chair that some people designed and built some time ago. Since sitting in a chair requires a particular posture, this invention is shaping your behaviour. There are societies without chairs. Just try to think how people in those societies would be sitting in order to do some reading.

Students sit on chairs in the "classrooms", but chairs are not found in all schools. In schools in most villages there are no chairs for students. They sit on the ground, or on a piece of sack spread over it. That in some societies children gather in rooms facing a teacher is another kind of cultural product, called "schooling". This institution may have material aspects, such as buildings, and ideational aspects, such as the notion that schooling should take place at a specific place and time, or the idea that individuals attending "schools" must be evaluated and given certificates on successful completion of schooling. This institution also provides with behavioural expectation for all those who participate in it . Both teachers and students have a series of roles to play and responsibilities to share. Individuals, families and communities have different views about schooling. Some believe that school education is a valuable thing. They have unshaken faith that school education can make people powerful and change their destiny. Others consider it neither valuable nor do they have faith in its strength as such. Some societies emphasise on equal education for boys and girls; others do not. Some groups widely participate in the process of schooling, others (e.g., some tribal groups) participate little or not at all. People with special needs often remain deprived of school education for a number of reasons. People's views about communities, gender, caste groups and those with special needs and their educability also differ widely across societies.

As you look around you will find that much of our life as human beings involves interacting with various cultural products, and behaving in accord with them. This means that culture shapes our behaviour in a significant manner. However, it may also be noted at this point that just as culture shapes us, we also shape our culture. Several anthropologists have pointed out the mutual influences of culture and psyche on each other. They suggest that the relationship between individuals and their social surroundings is interactive, and in the course of these interactions, they constitute each other. This perspective emphasises that human beings are not passive recipients of cultural forces. Instead, they themselves create the context in which their behaviour is shaped.

Activity 3.3

Talk to students belonging to different States regarding their food, festivals, dress, customs, etc.

Prepare a list of the differences and similarities and discuss with your teacher.

What is Culture?

In spite of the fact that culture is always with us, much confusion exists in defining culture. It is more like the notion of "energy" in physics or "group" in sociology. Some believe that culture really exists out there, and it matters to individuals, while others believe that culture does not really exist, instead it is an idea created and shared by a group of people.

The innumerable definitions of culture commonly point to some of its essential features. One is that culture includes behavioural products of others who preceded us. It indicates both substantial and abstract particulars that have prior existence in one form or another. Thus, culture is already there as we begin life. It contains *values* that will be expressed and a *language* in which to express them. It contains a *way of life* that will be followed by most of us who grow up in that context. Such a conceptualisation of culture tends to place it outside the individual, but there are also treatments of culture that places it in the minds of individuals. In the latter case, culture is identified with a historically transmitted pattern of meanings embodied in symbols. Culture provides meaning by creating significant categories like social practices (e.g., marriage) and roles (e.g., bridegroom) as well as values, beliefs and premises. As Richard Shweder put it, to learn that "a mother's sister's husband is an uncle", one must somehow receive the 'frame' of understanding from others.

Whether culture is taken as an existing reality, or as an abstraction, or both, it exerts many real influences on human behaviour. It allows us to categorise and explain many important differences in human behaviour that were previously attributed to biological differences. Social and cultural contexts within which human development takes place vary widely over time and place. For example, some twenty years ago children in India would not have known several products that are now part of a child's world. Similarly an Adivasi living in a remote forest or hilly area would not have a "pizza" or "sandwich" as breakfast.

In the previous paragraphs, we have made frequent use of the terms **culture** and **society**. Often they are considered to carry similar meaning. Let us note at this point that they are not the same thing. A society is a group of people who occupy a particular territory and speak a common language not generally understood by neighbouring people. A society may or may not be a single nation, but every society has its own culture, and it is culture that shapes human behaviour from society to society. Culture is the label for all the different features that vary from society to society. It is these different features of society whose influences psychologists want to examine in their studies of human behaviour. Thus, a group of people, who manage their livelihood through hunting and gathering in forests, would present a life characterised by certain features that will not be found in a society that lives mainly on agricultural produce or wage earnings.

Cultural Transmission

We have seen earlier that as human beings we are both biological and socio-cultural creatures. As biological creatures, we have certain vital needs. Their fulfilment enhances our chances of surviving. In fulfilling these needs we use most of our acquired skills. We also have a highly developed capacity to benefit from experiences of our own and those of others. No other creature has learning capacity to the same extent as we have. No other creature has created an organised system of learning, called education, and none in this universe wants to learn as much as we do. As a result, we display many forms of behaviour that are uniquely human, and creations of what we call culture. The processes of *enculturation* and *socialisation* make us cultural beings.

ENCULTURATION

Enculturation refers to all learning that takes place without direct, deliberate teaching. We learn certain ideas, concepts, and values

simply because of their availability in our cultural context. For example, what is "vegetable" and what is "weed" or what is "cereal" and what is "non-cereal" is defined by what is already there, previously labelled as "vegetable" or "cereal" and agreed upon by people at large. Such concepts are transmitted, both directly and indirectly, and are learned very well because they are an integral part of the life of a cultural group, and are never questioned. All such examples of learning are called "enculturation".

Thus, enculturation refers to all learning that occurs in human life because of its availability in our socio-cultural context. The key element of enculturation is learning by observation. Whenever we learn any content of our society by observation, enculturation is in evidence. These contents are culturally shaped by our preceding generations. In this sense, enculturation always refers to learning something that is already available. A major part of our behaviour is the product of enculturation. In Indian families, many complex activities, like cooking, are learned by observation. There is no prescribed curriculum and no textbook for such activities, and there is also no deliberate instruction for cooking.

Although the effects of enculturation are obvious, people are generally not aware of these effects. They are also generally not aware of what is not available in the society to be learned. This leads to an apparent paradox that people who are most thoroughly enculturated are often the least aware of their culture's role in modeling them.

SOCIALISATION

Socialisation is a process by which individuals acquire knowledge, skills and dispositions, which enable them to participate as effective members of groups and society. It is a process that continues over the entire life-span, and through which one learns and develops ways of effective functioning at any stage of development. Socialisation forms the basis of social and cultural transmission from one generation to the next. Its failure in any society may endanger the very existence of that society.

The concept of socialisation suggests that all human beings are capable of a far greater repertoire of behaviours than they ever exhibit. We begin life in a particular social context, and there we learn to make certain responses and not others. The most clear example is our linguistic behaviour. Although we can speak any language that exists in this world, we learn to speak only that language which people around us speak. Within this social context we also learn many other things (e.g., when to express emotions and when to suppress them).

The probability of our behaving in a particular way is greatly affected by people who relate to us. Any one who possesses power relative to us can socialise us. Such people are called "*socialisation agents*". These agents include parents, teachers and other elders, who are more knowledgeable in the ways of their society. Under certain conditions, however, even our age peers can affect socialisation.

The process of socialisation is not always a smooth transition between the individual and the socialisation agent. It sometimes involves conflicts. In such situations not only are some responses punished, but some are also blocked by the behaviour of others in effective ways. At the same time, several responses need to be rewarded so that they acquire greater strength. Thus, reward and punishment serve as basic means for achieving the goals of socialisation. In this sense, all socialisation seems to involve efforts by others to control behaviour.

Socialisation although primarily consists of deliberate teaching for producing "acceptable" behaviour, the process is not unidirectional. Individuals are not only influenced by their social environment, but they also influence it. In societies that comprise many social groups, individuals may choose those to which they wish to belong. With increased migration, individuals are not only socialised once, but are often re-socialised differently in their life-span. This process is

known as *acculturation* which we will discuss later in this chapter.

Due to the processes of enculturation and socialisation we find behavioural similarities within societies and behavioural differences across societies. Both processes involve learning from other people. In the case of socialisation, the learning involves deliberate teaching. In the case of enculturation, teaching is not necessary for learning to take place. Enculturation means engagement of people in their culture. Since most of the learning takes place with our engagement in our culture, socialisation can be easily subsumed under the process of enculturation.

A good deal of our learning involves both enculturation and socialisation. Language learning is a good example. While a lot of language learning takes place spontaneously, there is also certain amount of direct teaching of the language, such as in grammar courses in elementary schools. On the other hand, learning of language other than the mother tongue, such as learning of Hindi by a European child, or of French by a child in India, is completely a deliberate process.

Socialisation Agents

A number of people who relate to us possess power to socialise us. Such people are called "*socialisation agents*". Parents and family members are the most significant socialisation agents. Legal responsibility of child care, too, lies with parents. Their task is to nurture children in such a manner that their natural potentials are maximised and negative behaviour tendencies are minimised or controlled. Since each child is also part of a larger community or society, several other influences (e.g., teachers, peer groups) also operate on her/his life. We will briefly discuss some of these influences.

Parents

Parents have most direct and significant impact on children's development. Children respond in different ways to parents in different situations. Parents encourage certain behaviours by rewarding them verbally (e.g., praising) or in other tangible ways (e.g., buying chocolates or objects of child's desire). They also discourage certain behaviours through non-approving behaviours. They also arrange to put children in a variety of situations that provide them with a variety of positive experiences, learning opportunities, and challenges. While interacting with children parents adopt different strategies, which are generally known as parenting styles. A distinction is made between authoritative, authoritarian and democratic or permissive parenting styles. Studies indicate that parents vary enormously in the treatment of children in terms of their *degree of acceptance* and *degree of control*. The conditions of life in which parents live (poverty, illness, job stress, nature of family) also influence the styles they adopt in socialising children. Grandparental proximity and network of social relationships play considerable role in child socialisation directly or through parental influences.

School

School is another important socialising agent. Since children spend a long time in schools, which provide them with a fairly organised set up for interaction with teachers and peers, school is today being viewed as a more important agent of child socialisation than parents and family. Children learn not only cognitive skills (e.g., reading, writing, doing mathematics) but also many social skills (e.g., ways of behaving with elders and age mates, accepting roles, fulfilling responsibilities). They also learn and internalise the norms and rules of society. Several other positive qualities, such as self-initiative, self-control, responsibility, and creativity are encouraged in schools. These qualities make children more self-reliant. If the transaction has been successful, the skills and knowledge children acquire in schools either through curriculum or interaction with teachers and peers also get transferred to other domains of their life. Many researchers believe that a good school can altogether transform a child's personality. That is why we find that even poor parents want to send their children to good schools.

Peer Groups

One of the chief characteristics of the middle childhood stage is the extension of social network beyond home. Friendship acquires great significance in this respect. It provides children not only with a good opportunity to be in company of others, but also for organising various activities (e.g., play) collectively with the members of their own age. Qualities like sharing, trust, mutual understanding, role acceptance and fulfilment develop in interaction with peers. Children also learn to assert their own point of view and accept and adapt to those of others. Development of self-identity is greatly facilitated by the peer group. Since communication of children with peer group is direct, process of socialisation is generally smooth.

Media Influences

In recent years media has also acquired the property of a socialisation agent. Through television, newspapers, books and cinema the external world has made/is making its way into our home and our lives. While children learn about many things from these sources, adolescents and young adults often derive their models from them, particularly from television and cinema. The exposure to violence on television is a major issue of discussion, since studies indicate that observing violence on television enhances aggressive behaviour among children. There is a need to use this agent of socialisation in a better way in order to prevent children from developing undesirable behaviours.

Activity 3.4

Observe 4-5 families belonging to different cultural and socio-economic background for about half an hour in the morning and evening interacting with their children for five days.

Do you find any difference in parental interaction with their sons and daughters?

Note their distinct pattern of behaviour and discuss this with your teacher.

Acculturation

Acculturation refers to cultural and psychological changes resulting from contact with other cultures. Contact may be direct (e.g., when one moves and settles in a new culture) or indirect (e.g., through media or other means). It may be voluntary (e.g., when one goes abroad for higher studies, training, job, or trade) or involuntary (e.g., through colonial experience, invasion, political refuge). In both cases, people often need to learn (and also they do learn) something new to negotiate life with people of other cultural groups. For example, during the British rule in India many individuals and groups adopted several aspects of British lifestyle. They preferred to go to the English schools, take up salaried jobs, dress in English clothes, speak English language, and change their religion.

Acculturation can take place any time in one's life. Whenever it occurs, it requires re-learning of norms, values, dispositions, and patterns of behaviour. Changes in these aspects require re-socialisation. Sometimes people find it easy to learn these new things, and if their learning has been successful, shifts in their behaviour easily take place in the direction of the group that brings in acculturation. In this situation transition to a new life is relatively smooth and free from problems. On the other hand, in many situations people experience difficulties in dealing with new demands of change. They find change difficult, and are thrown into a state of conflict. This situation is relatively painful as it leads to experience of stress and other behavioural difficulties by acculturating individuals and groups.

Psychologists have widely studied how people psychologically change during acculturation. For any acculturation to take place contact with another cultural group is essential. This often generates some sort of conflict. Since people cannot live in a state of conflict for a long time, they often resort to certain strategies to resolve their conflicts. For a long time it was felt that social or cultural change oriented towards modernity was

unidirectional, which meant that all people confronting the problem of change would move from a traditional state to a state of modernity. However, studies carried out with immigrants to western countries and native or tribal people in different parts of the world have revealed that people have various options to deal with the problem of acculturative changes. Thus, the course of acculturative change is multidirectional.

Activity 3.5

Make an attempt to find out people who have lived for an extended period of time in different cultures. Interview and ask them to give some examples of cultural differences and similarities in attitudes, norms, and values.

Changes due to acculturation may be examined at subjective and objective levels. At the subjective level, changes are often reflected in people's attitudes towards change. They are referred to as *acculturation attitudes*. At the objective level, changes are reflected in people's day-to-day behaviours and activities. These are referred to as *acculturation strategies*. In order to understand acculturation, it is necessary to examine it at both levels. At the objective level of acculturation, one can look at a variety of changes that might be evident in people's life. Language, dressing style, means of livelihood, housing and household goods, ornaments, furniture, means of entertainment, use of technology, travel experience, and exposure to movies, etc. can provide clear indications of change that individuals and groups might have accepted in their life. Based on these indicators, we can easily identify the degree to which acculturative change has entered into an individual's or a group's life. The only problem is that these indicators do not always indicate conscious acceptance of change by individuals or groups; they are held by people because they are easily available and economically affordable. Thus, in some cases, these indicators appear somewhat deceptive.

In order to place some confidence in conscious acceptance of change, we need to analyse them at the subjective level. John Berry is well-known for his studies on psychological acculturation. He argues that there are two important issues that all acculturating individuals and groups face in culture-contact situations. One relates to the degree to which there is a desire to maintain one's culture and identity. Another relates to the degree to which there is a desire to engage in daily interactions with members of other cultural group(s).

Based on people's positive or negative answer to these issues, the following four acculturative strategies have been derived:

Integration : It refers to an attitude in which there is an interest in both, maintaining one's original culture and identity, while staying in daily interaction with other cultural groups. In this case, there is some degree of cultural integrity maintained while interacting with other cultural groups.

Assimilation : It refers to an attitude, which people do not wish to maintain their cultural identity, and they move to become an integral part of the other culture. In this case, there is loss of one's culture and identity.

Separation : It refers to an attitude in which people seem to place a value on holding on to their original culture, and wish to avoid interaction with other cultural groups. In this case, people often tend to glorify their cultural identity.

Marginalisation : It refers to an attitude in which there is little possibility or interest in one's cultural maintenance, and little interest in having relations with other cultural groups. In this case, people generally remain undecided about what they should do, and continue to stay with a great deal of stress.

You have read in this chapter that human behaviour is not fully under the control of biological factors alone. Socio-cultural factors interact with biological dispositions of individuals to give a particular shape to their behaviour in a given society. Since societies and cultures across the globe are not homogeneous, human behaviour is also not expressed in the same way everywhere. This

allows us to say that besides biological roots, there are cultural roots of human behaviour. While genes write the script of biological transmissions, **memes** write the script of cultural transmissions. The genes and memes work together to allow behaviour to unfold partly in some similar and partly in different ways within and across societies. Understanding of cultural basis of behaviour will make you realise that behavioural differences between individuals or groups are not due to the structural and functional properties of their biological system alone. Cultural features of individuals and groups contribute in significant ways in generating behavioural differences.

Key Terms

Acculturation, All-Or-None Property/Principle, Arousal, Axons, Brain stem, Central nervous system, Cerebellum, Cerebral cortex, Chromosomes, Cortex, Culture, Deoxyribonucleic Acid (DNA), Enculturation, Endocrine glands, Environment, Evolution, Genes, Hemispheres, Heredity, Homo sapiens, Homeostasis, Hypothalamus, Medulla, Memes, Nerve impulse, Neurons, Nucleus, Reticular Activating System (RAS), Skeletal muscles, Socialisation, Soma (Cell body), Somatic nervous system, Species, Synaptic vesicles

Summary

- *The human nervous system consists of billions of interconnected, highly specialised cells called neurons. Neurons or nerve cells control and coordinate all human behaviour.*
- *The central nervous system (CNS) consists of the brain and spinal cord. Peripheral nervous system branches out from the CNS to all parts of the body. It has two divisions: the somatic nervous system (related to the control of skeletal muscles) and the autonomic nervous system (related to control of internal organs). The autonomic system is sub-divided into the sympathetic and parasympathetic systems.*
- *Neurons have dendrites, which receive impulses; and the axon, which transmits impulses from cell body to other neurons or to muscle tissue.*
- *Every axon is separated by a gap called synapse. A chemical called neurotransmitter is released from the axon terminal that carries the message to the other neuron.*
- *The central core of the human brain includes hindbrain (consisting of the medulla, the pons, the reticular formation, and the cerebellum), the midbrain, and the thalamus and hypothalamus. Above the central core lies the forebrain or cerebral hemispheres.*
- *The limbic system is involved in the regulation of behaviours such as fighting, fleeing etc. It is comprised of hippocampus, amygdala and hypothalamus.*
- *The endocrine system consists of the glands; pituitary gland, thyroid gland, adrenal gland, pancreas and gonads. The hormones secreted by them play a crucial role in behaviour and development.*
- *In addition to biological factors, culture is considered an important determinant of human behaviour. If refers to the man-made part of the environment, which has two aspects — material and subjective. It refers to a shared way of life of a group of people through which they derive meanings of their behaviours and base their practices. These meanings and practices are transmitted through generations.*
- *Though, biological factors play a general enabling role, the development of specific skills and competencies is dependent upon the cultural factors and processes.*
- *We learn about culture through the processes of enculturation and socialisation. Enculturation refers to all learning that take place without direct, deliberate teaching.*
- *Socialisation is a process by which individuals acquire knowledge, skills and dispositions,*

which enable them to participate as effective members of groups and society. The most significant socialisation agents are parents, school, peer groups, mass media, etc.

- *Acculturation refers to cultural and psychological changes resulting from contact with other cultures. The acculturative strategies adopted by individuals during the course of acculturation are integration, assimilation, separation, and marginalisation.*

Review Questions

1. How does the evolutionary perspective explain the biological basis of behaviour?
2. Describe how neurons transmit information?
3. Name the four lobes of the cerebral cortex. What functions do they perform?
4. Name the various endocrine glands and the hormones secreted by them. How does the endocrine system affect our behaviour?
5. How does the autonomic nervous system help us in dealing with an emergency situation?
6. Explain the meaning of culture and describe its important features.
7. Do you agree with the statement that 'biology plays an enabling role, while specific aspects of behaviour are related to cultural factors'? Give reasons in support of your answer.
8. Describe the main agents of socialisation.
9. How can we distinguish between enculturation and socialisation? Explain.
10. What is meant by acculturation? Is acculturation a smooth process? Discuss.
11. Discuss the acculturative strategies adopted by individuals during the course of acculturation.

Project Ideas

1. Collect information on a person with brain damage. You can take help from a doctor, consult books or search the internet. Compare it with the normal functioning brain and prepare a report.
2. Write down your daily routine. This should include the activity undertaken, as well as the time when it is done. For example, if you watch television between 7 p.m. and 8 p.m. daily, you should write down the time as well as the activity. Put in as many details as you can. You could include names of the specific programmes you watch on Television. Make a separate schedule for weekdays and weekends. The class can examine the daily schedules, and see which activities are more common amongst the students. Can some cultural values/beliefs be inferred to underlie common, shared experiences? (for example, that all students spend many hours in school on a daily basis reflects that they come from cultures which value school education).

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Chapter 4

Human Development

After reading this chapter, you would be able to

- describe the meaning and process of development,
- explain the influence of heredity, environment and context on human development,
- identify the stages of development and describe the major characteristics of infancy, childhood, adolescence, adulthood and old age, and
- reflect on your own course of development and related experiences.

I wish I could travel by the road that crosses the baby's mind, and out beyond all bounds; where messengers run errands for no cause between the kingdoms of kings of no history; where Reason makes kites of her laws and flies them, and Truth sets Fact free from its fetters.

– Rabindranath Tagore

Contents

Introduction
Meaning of Development
Life-Span Perspective on Development
Growth, Development, Maturation, and Evolution (Box 4.1)
Factors Influencing Development
Context of Development
Overview of Developmental Stages
Prenatal Stage
Infancy
Childhood
Gender and Sex Roles (Box 4.2)
Challenges of Adolescence
Adulthood and Old Age

Key Terms
Summary
Review Questions
Project Ideas

Introduction

If you look around, you will notice that from birth onwards changes of various kinds are taking place in an individual's life, which continue even during old age. Over a span of time, a human grows and develops, learns to communicate, walk, count, and read and write. S/he also learns to distinguish between right and wrong. S/he makes friends, goes through puberty, gets married, rears children, and grows old. Even though we differ from each other, we share many commonalities. Most of us learn to walk by the first year and talk by the second year. This chapter will familiarise you with the changes observed in people during the course of their life-span in different domains. You will learn about key developmental processes and changes taking place in major periods during the life-span: prenatal, infancy, childhood, adolescence, adulthood, and old age. This would be a journey of personal understanding and self-discovery which should help in your future development. The study of human development would also help you to deal with others better.

Meaning of Development

When we think of development, invariably we think of physical changes, as these are commonly observed at home with younger siblings, with parents and grandparents, in school with peers or others around us. From conception until the moment of death, we not only change physically, but we also change in the way we think, use language, and develop social relationships. Remember that, changes are not confined to any one area of a person's life; they occur in the person in an integrated manner. *Development is the pattern of progressive, orderly, and predictable changes that begin at conception and continue throughout life.* Development mostly involves changes — both growth and decline, as observed during old age.

Development is influenced by an interplay of biological, cognitive, and socio-emotional processes. Development due to genes inherited from parents, such as in height and weight, brain, heart, and lungs development, etc. all point towards the role of **biological processes**. The role of **cognitive processes** in development relate to mental activities associated with the processes of knowing, and experiencing, such as thought, perception, attention, problem solving, etc. **Socio-emotional processes** that influence development refer to changes in an individual's interactions with other people, changes in emotions, and in personality. A child's hug to her/his mother, a young girl's affectionate gesture to her/his sibling, or an adolescent's sorrow at losing a match are all reflections of socio-emotional processes deeply involved in human development.

Although you would be reading about the different processes in different chapters of this textbook, it is important to remember that the biological, cognitive, and socio-emotional processes are interwoven. These processes influence changes in the development of the individual as a whole throughout the human life-span.

Life-Span Perspective on Development

The study of development according to the Life-Span Perspective (LSP) includes the following assumptions :

1. Development is lifelong, i.e. it takes place across all age groups starting from

conception to old age. It includes both gains and losses, which interact in dynamic (change in one aspect goes with changes in others) ways throughout the life-span.

2. The various processes of human development, i.e. biological, cognitive, and socio-emotional are interwoven in the development of a person throughout the life-span.
3. Development is multi-directional. Some dimensions or components of a given dimension of development may increase, while others show decrement. For example, the experiences of adults may make them wiser and guide their decisions. However, with an increase in age, one's performance is likely to decrease on tasks requiring speed, such as running.
4. Development is highly plastic, i.e. within person, modifiability is found in psychological development, though plasticity varies among individuals. This means skills and abilities can be improved or developed throughout the life-span.
5. Development is influenced by historical conditions. For example, the experiences of 20-year olds who lived through the freedom struggle in India would be very different from the experiences of 20 year olds of today. The career orientation of school students today is very different from those students who were in schools 50 years ago.
6. Development is the concern of a number of disciplines. Different disciplines like psychology, anthropology, sociology, and neuro-sciences study human development, each trying to provide answers to development throughout the life-span.
7. An individual responds and acts on contexts, which include what was inherited, the physical environment, social, historical, and cultural contexts. For example, the life events in everyone's life are not the same, such as, death of a parent, accident, earthquake, etc., affect the course of one's life as also the positive

Box 4.1 Growth, Development, Maturation, and Evolution

Growth *refers to an increase in the size of body parts or of the organism as a whole. It can be measured or quantified, for example, growth in height, weight, etc.* ***Development*** *is a process by which an individual grows and changes throughout the life cycle. The term development applies to the changes that have a direction and hold definite relationship with what precedes it, and in turn, will determine what will come after. A temporary change caused by a brief illness, for example, is not considered a part of development. All changes which occur as a result of development are not of the same kind. Thus, changes in size (physical growth), changes in proportion (child to adult), changes in features (disappearance of baby teeth), and acquiring new features are varied in their pace and scope level. Development includes growth as one of its aspects.* ***Maturation*** *refers to the changes that follow an orderly sequence and are largely dictated by the genetic blueprint which produces commonalities in our growth and development. For example, most children can sit without support by 7 months of age, stand with support by 8 months and walk by one year. Once the underlying physical structure is sufficiently developed, proficiency in these behaviours requires adequate environment and little practice. However, special efforts to accelerate these behaviours do not help if the infant is maturationally not ready. These processes seem to "unfold from within": following an inner, genetically determined timetable that is characteristic of the species.* ***Evolution*** *refers to species-specific changes. Natural selection is an evolutionary process that favours individuals or a species that are best adapted to survive and reproduce. The evolutionary changes are passed from one generation to the next within a species. Evolution proceeds at a very slow pace. Emergence of human beings from great apes took about 14 million years. It has been estimated that the 'Homo sapiens' came into existence only about 50,000 years ago.*

influences such as winning an award or getting a good job. People keep on changing with changing contexts.

Factors Influencing Development

Have you observed in your class that some of you have dark skin, others have light coloured skins, colour of your hair and eyes are different, some of you are tall, others short, some are quiet or sad while others are talkative or cheerful. People also differ with respect to intelligence, learning abilities, memory, and other psychological characteristics besides physical characteristics. Despite these variations, no one can be mistaken for any other species: we all are *homo sapiens*. What causes us to be different from each other but at the same time more like each other? The answer lies in the interaction of heredity and environment.

You have already learned in Chapter 3 that the principles of heredity explain the mechanism for transmission of characteristics by every species from one generation to the next. We inherit genetic codes from our parents, which are in every cell of our body. Our genetic codes are alike in one important way; they contain the human genetic code. It is because of the human genetic code that a fertilised human egg grows into a human baby and cannot grow into an elephant, a bird or a mouse.

Genetic transmission is very complex. Most characteristics that we observe in humans are combinations of larger number of genes. You can imagine the combinations produced by 80,000 or more genes – accounting for a variety of characteristics and behaviours. It is also not possible to possess all the characteristics made available to us by our genetic structure. The actual genetic material or a person's genetic heritage is known as **genotype**. However, not all of this genetic material is apparent or distinctly identifiable in our observable characteristics. **Phenotype** is the way an individual's genotype is expressed in observable and measurable characteristics. Phenotypes include physical traits, such as height, weight, eye and skin colour, and many of the psychological characteristics such as intelligence, creativity, and personality. These observable characteristics of an individual are the result of the interaction between the person's inherited traits and the environment. You know it is the genetic code which predisposes a child to develop in a particular way. Genes provide a distinct blueprint and timetable for the development of an individual. But genes do not exist in isolation and development occurs within the context of an individual's environment. This is what makes each one of us a unique person.

What are the environmental influences? How does the environment affect development? Imagine a child, with genotype that predisposes her/him to be introverted, in an environment that promotes social interaction and extroversion. The influence of such an environment may make the child a little extroverted. Let us take another example. An individual with "short" height genes, even if s/he is in a very good nutritional environment, will never be able to be taller than average. This shows that genes set the limit and within that limit the environment influences development.

You know by now that parents provide the genes for the child's development. Do you know that they also play an important role in determining the type of environment their children will encounter? Sandra Scarr (1992) believes that the environment parents provide for their children depends to some extent on their own genetic predisposition. For example, if parents are intelligent and are good readers they would provide their children with books to read, with the likely outcome that their children would become good readers who enjoy reading. A child's own genotype (what s/he has inherited) such as being cooperative, and attentive is likely to result in teachers and parents giving more pleasant response as compared to children who are not cooperative or not attentive. Besides these, children themselves choose certain environments

based on their genotype. For example, because of their genotype, children may perform well in music or sports and they will seek and spend more time in environments, which will enable them to perform their musical skills; similarly an athlete would seek sports-related environment. These interactions with environment keep changing from infancy through adolescence. Environmental influences are as complex as the genes we inherit.

If your class monitor is selected on the basis of being academically bright and a popular student, do you think it is because of her/his genes or the influence of the environment? If a child from a rural area who is very intelligent, is not able to get a job because of her/his inability to express herself/himself fluently or handle computers, do you think - it is because of genes or environment?

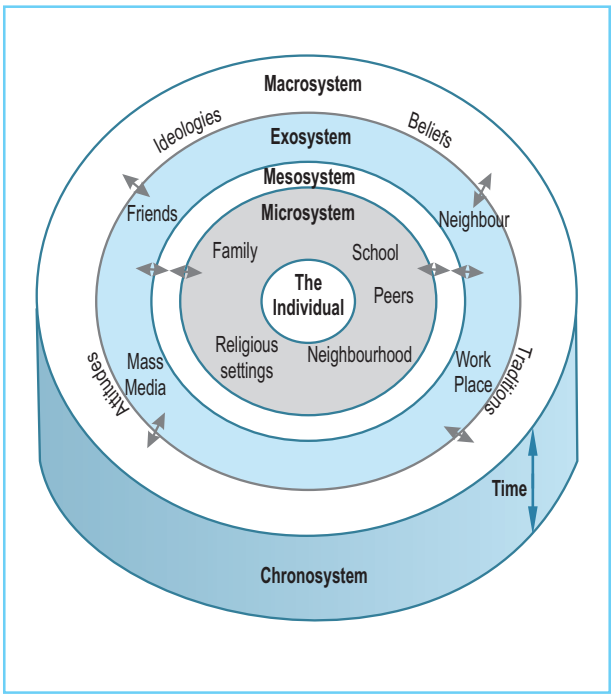

Fig.4.1 : Bronfenbrenner's Contextual View of Development

Context of Development

Development does not take place in a vacuum. It is always embedded in a particular socio-cultural context. As you shall read in this chapter, transition during one's lifetime such as entering school, becoming an adolescent, finding jobs, marrying, having children, retirement, etc. all are joint functions of the biological changes and changes in one's environment. The environment can change or alter during any time of the individual's life-span.

Urie Bronfenbrenner's contextual view of development emphasises the role of environmental factors in the development of an individual. This has been depicted in Figure 4.1.

The **microsystem** is the immediate environment/setting in which the individual lives. It is in these settings where the child directly interacts with social agents – the family, peers, teachers, and neighbourhood. The **mesosystem** consists of relations between these contexts. For instance, how a child's parents relate to the teachers, or how the parents view the adolescent's friends, are experiences likely to influence an individual's relationships with others. The **exosystem** includes events in social settings where the child does not participate directly, but they influence the childs' experiences in the immediate context. For example, the transfer of father or mother may cause tension among the parents which might affect their interactions with the child or the general amenities available to the child like quality of schooling, libraries, medical care, means of entertainment, etc. **Macrosystem** includes the culture in which the individual lives. You have read in Chapter 3 about the importance of culture in the development of an individual. **Chronosystem** involves events in the individual's life course, and socio-historical circumstances of the time such as, divorce of parents or parents' economic setback, and their effect on the child.

In a nutshell, Bronfenbrenner's view is that a child's development is significantly affected by the complex world that envelops her/him – whether it be the minutiae of the conversations s/he has with her/his

playmates, or the social and economic life-circumstances into which s/he is born. Research has shown that children in impoverished environments have unstimulating environment devoid of books, magazines, toys, etc., lack experiences such as visits to library, museum, zoo, etc., have parents who are ineffective as role models, and live in overcrowded and noisy surroundings. As a result of these conditions children are at a disadvantage and have difficulties in learning.

Durganand Sinha (1977) has presented an ecological model for understanding the development of children in Indian context. Ecology of the child could be viewed in terms of two concentric layers. The "upper and the more visible layers" consist of home, school, peer groups, and so on. The most important ecological factors influencing development of the child in the visible upper layer constitute the: (i) home, its conditions in terms of overcrowding, space available to each member, toys, technological devices used, etc., (ii) nature and quality of schooling, facilities to which the child is exposed, and (iii) nature of interactions and activities undertaken with peer groups from childhood onwards.

These factors do not operate independently but constantly interact with one another. Since these are also embedded in a larger and a more pervasive setting, the "surrounding layers" of the child's ecology constantly influence the "upper layer" factors. However, their influences are not always clearly visible. The elements of the surrounding layer of ecology constitute the: (i) general geographical environment. It includes space and facilities for play and other activities available outside the home including general congestion of the locality and density of population, (ii) institutional setting provided by caste, class, and other factors, and (iii) general amenities available to the child like drinking water, electricity, means of entertainment and so on.

The visible and the surrounding layer factors interact with one another and may have different consequences for development in different people. The ecological environment can change or alter during any time of the individual's life-span. Therefore, to understand differences in the functioning of an individual, it is important to see the individual in the context of her/his experiences.

Activity 4.1

What would your life be if you lived in a rural area or a small town, devoid of all amenities, which you are used to in a city (or vice-versa)? Discuss in small groups keeping in mind factors like poverty, illiteracy, pollution, population, etc.

Overview of Developmental Stages

Development is commonly described in terms of periods or stages. You must have observed that your younger brother or sister, or parents, and even yourself, all behave in different ways. If you observe people living in your neighbourhood, you would find that they too do not behave in a similar manner. This variation is partly because everyone is in a different stage of life. Human life proceeds through different **stages**. For example, you are at present in the stage of adolescence and after a few years you will enter the stage of adulthood. Developmental stages are assumed to be temporary and are often characterised by a dominant feature or a leading characteristic, which gives each period its uniqueness. During a particular stage, individual progresses towards an assumed goal - a state or ability that s/he must achieve in the same order as other persons before progressing to the next stage in the sequence. Of course, individuals do vary with respect to the time or rate of development from one stage to another. It may be noted that certain patterns of behaviour and certain skills are learned more easily and successfully during certain stages. These accomplishments of a person become the social expectations of that stage of development. They are known as

developmental tasks. You will now read about the different stages of development and their main features.

Prenatal Stage

The period from conception to birth is known as the prenatal period. Typically, it lasts for about 40 weeks. You know by now that the genetic blueprint guides our development during the prenatal period and after birth. Both genetic and environmental factors affect our development during different periods of prenatal stage.

Prenatal development is also affected by maternal characteristics, which include mother's age, nutrition, and emotional state. Disease or infection carried by the mother can adversely affect prenatal development. For example, rubella (German measles), genital herpes, and Human Immunodeficiency Virus (HIV) are believed to cause genetic problems in the newborn. Another source of threat to prenatal development is **teratogens** - environmental agents that cause deviations in normal development that can lead to serious abnormalities or death. Common teratogens include drugs, infections, radiations, and pollution. Intake of drugs (marijuana, heroin, cocaine, etc.), alcohol, tobacco, etc. by women during pregnancy may have harmful effects on the foetus and increase the frequency of congenital abnormalities. Radiations (such as X-rays), and certain chemicals near industrial areas can cause permanent change in the genes. Environmental pollutants and toxic wastes like carbon monoxide, mercury and lead are also sources of danger to the unborn child.

Infancy

The brain develops at an amazing rate before and after birth. You have already read in Chapter 3 about the parts of the brain and the important role played by cerebrum in human functions, such as language, perception, and intelligence. Just before birth the newborns have most but not all brain cells. The neural connections among these cells develop at a rapid rate.

The newborn is not as helpless as you might think. The activities needed to sustain life functions are present in the newborn — it breathes, sucks, swallows, and discharges the bodily wastes. The newborns in their first week of life are able to indicate what direction a sound is coming from, can distinguish their mother's voice from the voices of other women, and can imitate simple gestures like tongue protrusion and mouth opening.

Motor Development : The newborn's movements are governed by **reflexes** — which are automatic, built-in responses to stimuli. They are genetically-carried survival mechanisms, and are the building blocks for subsequent motor development. Before the newborns have had the opportunity to learn, reflexes act as adaptive mechanisms. Some reflexes present in the newborn — coughing, blinking, and yawning persist throughout their lives. Others disappear as the brain functions mature and voluntary control over behaviour starts developing (see Table 4.1).

As the brain is developing, physical development also progresses. As the infant grows, the muscles and nervous system mature which lead to the development of finer skills. Basic physical (motor) skills include grasping and reaching for objects, sitting, crawling, walking and running. The sequence of physical (motor) development is universal, with minor exceptions.

Sensory Abilities : You know by now that newborns are not as incompetent as they look. They can recognise their mother's voice just a few hours after birth and have other sensory capabilities. How well can infants see? Newborns prefer to look at some stimuli rather than others such as faces, although these preferences change over the first few months of life. The newborn's vision is estimated to be lower than the adult vision. By 6 months it improves and by about the first year, vision is almost the same as that of an adult (20/20). Can a newborn see colour? The current consensus is that they might be able to distinguish between red and white colours but

Table 4.1 Some Major Reflexes in the Newborn

Reflex	*Description*	*Developmental Course*
Rooting	Turning the head and opening the mouth when touched on the cheek	Disappears between 3 and 6 months
Moro	If there is a loud noise, the baby will throw her/his arms outward while arching her/his back, and then bring the arms together as if grasping something	Disappears in 6 to 7 months (although reaction to loud noises is permanent)
Grasp	When a finger or some other object is pressed against the baby's palm, the baby's fingers close around it	Disappears in 3 to 4 months; replaced by voluntary grasping
Babinski	When the bottom of the baby's foot is stroked, the toes fan out and then curl	Disappears in 8 to 12 months

in general they are colour deficient and full colour vision develops by 3 months of age.

What is the nature of hearing in newborns? Infants can hear immediately after birth. As the infant develops, proficiency at localising sound improves. Newborns respond to touch and they can even feel pain. Both smell and taste capacities are also present in the newborn.

Cognitive Development : Does a 3 year old child understand things the same way as would an 8 year old? Jean Piaget stressed that children actively construct their understanding of the world. Information does not simply enter their minds from the environment. As children grow, additional information is acquired and they adapt their thinking to include new ideas, as this improves their understanding of the world. Piaget believed that a child's mind passes through a series of stages of thought from infancy to adolescence (see Table 4.2).

Each stage is characterised by a distinct way of thinking and is age related. It is important to remember that it is the different way of thinking which makes one stage more advanced than the other and not the amount of information. This also shows why you at your age think differently from an 8 year old. The child during infancy, i.e. the first two years of life, experiences the world through senses and interactions with objects — through looking, hearing, touching, mouthing, and grasping. The newborn lives in the present. What is out of sight is out of mind. For example, if you hide the toy in front of the child with which the child has been playing, the young infant would react as if nothing has happened, i.e. s/he will not search for the toy. The child assumes the toy does not exist. According to Piaget, children at this stage do not go beyond their immediate sensory experience, i.e. lack **object permanence** — the awareness that the objects continue to exist when not perceived. Gradually by 8 months of age the child starts pursuing the object partially covered in her/his presence.

The basis of verbal communication seems to be present in infants. Vocalisation begins with the infant's babbling, sometime between 3 to 6 months of age. You will read about early language development in Chapter 8.

Socio-emotional Development : Babies from birth are social creatures. An infant starts preferring familiar faces and responds to parent's presence by cooing and gurgling. They become more mobile by 6 to 8 months of age and start showing a preference for their mother's company. When frightened by a new face or when separated from their mother, they

Table 4.2 Piaget's Stages of Cognitive Development

Stage	*Approximate Age*	*Characteristics*
Sensorimotor	0-2 years	Infant explores the world by coordinating sensory experiences with physical actions.
Preoperational	2-7 years	Symbolic thought develops; object permanence is established; the child cannot coordinate different physical attributes of an object.
Concrete operational	7-11 years	The child can reason logically about concrete events and classify objects into different sets. Is able to perform reversible mental operations on representations of objects.
Formal operational	11-15 years	The adolescent can apply logic more abstractly; hypothetical thinking develops.

cry or show distress. On being reunited with the parent or caregiver they reciprocate with smiles or hugs. The close emotional bond of affection that develop between infants and their parents (caregivers) is called **attachment**. In a classic study by Harlow and Harlow (1962), baby monkeys were separated from their mothers approximately 8 hours after birth. The baby monkeys were placed in experimental chambers and reared for 6 months by surrogate (substitute) "mothers", one made of wire and the other of cloth. Half the baby monkeys were fed by the wire mother, half by the cloth mother. Regardless of whether they were fed by the wire or the cloth mother the baby monkeys showed a preference for the cloth mother and spent a lot more time with her. This study clearly demonstrates that providing nourishment or feeding was not crucial for attachment and contact-comfort is important. You too may have seen young children having a strong attachment to a favourite toy or blanket. There is nothing unusual in this, as the children know that the blanket or toy is not their mother. Yet it provides them comfort. As children grow and become more sure of themselves, they abandon these objects.

Human babies also form an attachment with their parents or caregivers who consistently and appropriately reciprocate to their signals of love and affection. According to Erik Erikson (1968), the first year of life is the key time for the development of attachment. It represents the stage of developing *trust* or *mistrust*. A sense of trust is built on a feeling of physical comfort which builds an expectation of the world as a secure and good place. An infant's sense of trust is developed by responsive and sensitive parenting. If the parents are sensitive, affectionate, and accepting, it provides the infant a strong base to explore the environment. Such infants are likely to develop a secure attachment. On the other hand, if parents are insensitive and show dissatisfaction and find fault with the child, it can lead to creating feelings of self-doubt in the child. Securely attached infants respond positively when picked up, move freely, and play whereas insecurely attached infants feel anxious when separated and cry due to fear and get upset. A close interactive relationship with warm and affectionate adults is a child's first step towards healthy development.

Childhood

The child's growth slows down during early childhood as compared to infancy. The child develops physically, gains height and weight,

learns to walk, runs, jumps, and plays with a ball. Socially, the child's world expands from the parents to the family and adults near home and at school. The child also begins to acquire the concepts of good and bad, i.e. develops a sense of morality. During childhood, children have increased physical capacities, can perform tasks independently, can set goals, and meet adult expectations. The increasing maturation of the brain along with opportunities to experience the world, contribute to development of children's cognitive abilities.

Physical Development : Early development follows two principles : (i) development proceeds **cephalocaudally**, i.e. from the cephalic or head region to the caudal or tail region. Children gain control over the upper part of the body before the lower part. This is why you would notice that the infant's head is proportionately larger than her/his body during early infancy or if you see an infant crawling, s/he will use the arms first and then shift to using the legs, (ii) growth proceeds from the centre of body and moves towards the extremities or more distal regions — the **proximodistal** trend, i.e. children gain control over their torso before their extremities. Initially infants reach for objects by turning their entire body, gradually they extend their arms to reach for things. These changes are the result of a maturing nervous system and not because of any limitation since even visually impaired children show the same sequence.

As children grow older, they look slimmer as the trunk part of their bodies lengthens and body fat decreases. The brain and the head grow more rapidly than any other part of the body. The growth and development of the brain are important as they help in the maturation of children's abilities, such as eye-hand coordination, holding a pencil, and attempts made at writing. During middle and late childhood years, children increase significantly in size and strength; increase in weight is mainly due to increase in the size of the skeletal and muscular systems, as well as size of some body organs.

Motor Development : Gross motor skills during the early childhood years involve the use of arms and legs, and moving around with confidence and more purposefully in the environment. Fine motor skills — finger dexterity and eye-hand coordination — improve substantially during early childhood. During these years the child's preference for left or right hand also develops. The major accomplishments in gross and fine motor skills during early childhood years are given in Table 4.3.

Cognitive Development : The child's ability to acquire the concept of object permanence enables her/him to use mental symbols to represent objects. However, the child at this stage lacks the ability that allows her/him to do mentally what was done physically before. Cognitive development in early childhood focuses on Piaget's stage of **preoperational thought** (see Table 4.2). The child gains the ability to mentally represent an object that is not physically present. You may have observed children draw designs/ figures to represent people, trees, dog, house,

Table 4.3 Major Accomplishments in Gross and Fine Motor Skills

Age in Years	*Gross Motor Skills*	*Fine Motor Skills*
3 years	Hopping, jumping, running	Build blocks, pick objects with forefinger and thumb
4 years	Climb up and downstairs with one foot on each step	Fit jigsaw puzzle precisely
5 years	Run hard, enjoy races	Hand, arm, and body all coordinate with eye movement

etc. This ability of the child to engage in symbolic thought helps to expand her/his mental world. The progress in symbolic thought continues. A salient feature of preoperational thought is **egocentrism** (self-focus), i.e. children see the world only in terms of their own selves and are not able to appreciate others' point of view. Children because of egocentrism, engage in **animism** - thinking that all things are living, like oneself. They attribute life-like qualities to inanimate objects. For example, if a child while running slips on the road, s/he might show animism by saying "road hurt me". As children grow and are approximately between 4 and 7 years of age they want answers to all their questions like: Why is the sky blue? How do trees grow? and so on. Such questions help the child to know why things are as they are. Piaget called this the stage of *intuitive thought*. Another feature of thought during preoperational stage is characterised by children having a tendency for **centration**, i.e. focusing on a single characteristic or feature for understanding an event. For example, a child may insist on drinking a "big glass" of juice, preferring a tall narrow glass to a short broad one, even though both might be holding the same amount of juice.

As the child grows and is approximately between 7 and 11 years of age (the period of middle and late childhood) intuitive thought is replaced by *logical thought*. This is the stage of **concrete operational thought**, which is made up of operations — mental actions that allow the child to do mentally what was done physically before. Concrete operations are also mental actions that are reversible. In a well-known test, the child is presented with two identical balls of clay. One ball is rolled by the experimenter into a long thin strip and the other ball remains in its original shape. On being asked which has more clay, the child of 7 or 8 years, would answer that, both have the same amount of clay. This is because the child imagines the ball rolled into thin strip and then into a ball, that means s/he is able to imagine reversible mental action on concrete/real objects. What do you think a preoperational child would have done? S/he is likely to focus on only one aspect-length or height. Concrete operations allow the child to focus on different characteristics and not focus on one aspect of the object. This helps the child to appreciate that there are different ways of looking at things, which also results in the decline of her/his egocentrism. Thinking becomes more flexible, and children can think about alternatives when solving problems, or mentally retrace their steps if required. Even though the preoperational child develops the ability to see relationships between different properties of an object, s/he cannot do abstract thinking, i.e. s/he still cannot manipulate ideas in the absence of objects. For example, steps required to complete algebraic equations, or imagining line of longitude or latitude of the earth.

The growing cognitive abilities of children facilitate the acquisition of language. You will read in Chapter 8, how children develop vocabulary and grammar.

Activity 4.2

Take two transparent glasses of the same size and pour same amount of water in both. Ask a child of Class II and Class V of your school: whether the glasses contain the same amount of water? Take another tall thin glass and in front of the child empty water from one of the earlier glasses to the third glass. Now ask her/him which glass has more water? Did you find any difference in their responses?

Socio-emotional Development : The important dimensions of children's socio-emotional development are the **self**, **gender** and **moral** development. During the early years of childhood, some important developments in the self take place. The child due to socialisation has developed a sense of who s/he is and whom s/he wants to be identified with. The developing sense of independence makes children do things in their own way. According to Erikson, the way parents respond to their self-initiated activities

leads to developing a sense of initiative or sense of guilt. For example, giving freedom and opportunities for play like cycling, running, skating, etc. and answering children's questions will create a sense of support for the initiative taken. In contrast, if they are made to feel that their questions are useless, and games played by them are stupid, the children are likely to develop feelings of guilt over self-initiated activities, which may persist through the children's later life also. Self-understanding in early childhood is limited to defining oneself through physical characteristics: I am tall, she has black hair, I am a girl, etc. During middle and late childhood, the child is likely to define oneself through internal characteristics such as, "I am smart and I am popular" or "I feel proud when teachers assign me responsibility in school". In addition to defining oneself through psychological characteristics, children's self-descriptions also include social aspects of self,

Box 4.2 Gender and Sex Roles

Is chess a man's game or woman's game or both? Is baking a woman's activity or a man's activity? What about driving, debating, and experimenting in a physics laboratory? Or consider some of the products sold on T.V. for young men and young women? What do they tell about how girls and boys should be?

Psychologists have meticulously researched on whether sex differences exist. Research shows that males have been consistently found to be more aggressive than females. Men perform better than women on tests of sit-ups, short-run speeds and long jumps. Women show better, fine eye-hand coordination than men do, and their joints and limbs are more flexible than men's. What do you think is the origin of these differences? Are these essential, or in other words, are women born with certain 'feminine' traits, and men with certain 'masculine' traits? Or are these differences the creation of the world we live in?

The most powerful roles into which people are socialised are gender roles. They specify the range of behaviours which are considered appropriate for males or females. While sex refers to the biological dimension of being male or female, gender refers to the social dimension of being male or female. There are several aspects of gender. Among these, important ones are gender identity of male or female, which most children begin to acquire by the time they are about 3 years old and can accurately label themselves as boys and girls. As they grow, preferences can be evidenced in their toys and play.

A gender role is a set of expectations that prescribes how females and males should think, act and feel. Parents are important influences on gender socialisation especially in the early years of development. Through rewards and punishments, they induce in children gender appropriate and inappropriate behaviours. Parents often use rewards and punishments to teach their daughters to be feminine and boys to be masculine. Peer influence is also considered to be a major contributor to gender socialisation.

Parents restrict school-aged girls more than they restrict school-aged boys, and assign boys and girls different types of chores. In everyday interactions, parents give their daughters a kind of 'dependence training', and their sons a kind of 'independence training'. Media, including cartoons and commercials are known to perpetuate gender stereotypes. Research on gender stereotypes in commercials shows that across cultures authority figures in commercials were males, and women were more likely to be shown in dependent and domestic roles, or women were more likely to sell body products, and men more likely to sell sports products.

Once children learn the role of male or female, they organise their world on the basis of gender also. Children's attention and behaviour are guided by an internal motivation to conform to gender based socio-cultural standards and stereotypes. Children also actively socialise themselves according to the gender mores of their culture. Once they have internalised gender standards, they begin to expect gender appropriate behaviour from themselves. Young boys may refuse to wear feminine clothes in a fancy dress competition. When playing house (ghar-ghar), *girls may refuse to play the father's role. Once they have identified with their own gender, children may model after a powerful cultural figure of the same gender. The "gender typing" occurs when individuals are ready to encode and organise information along the lines of what is considered appropriate or typical for males and females in a society.*

such as references to social groups like being a member of school's music club, environment club, or any religious group. Children's self-understanding also includes social comparison. Children are likely to think about what they can do or cannot do in comparison with others. For example, "I got more marks than Atul" or "I can run faster than others in the class". This developmental shift leads to establishing one's differences from others as an individual.

Once the children enter school their social world expands beyond their families. They also spend greater amount of time with their age mates or peers. Thus the increased time that children spend with their peers shapes their development.

Activity 4.3

Act like a boy if you are a girl or act like a girl if you are a boy for atleast one hour in front of your friends and parents. Reflect on your experience and note others' reaction to your behaviour. You can also ask them about their reactions. How difficult was it to perform like the other gender?

Moral Development : Another important aspect of the child's development is learning to differentiate between the rightness or wrongness of human acts. The way children come to distinguish right from wrong, to feel guilty, to put themselves in other people's position, and to help others when they are in trouble, are all components of moral development. Just as children pass through the various stages of cognitive development, according to Lawrence Kohlberg, they pass through the various stages of moral development, which are age related. Kohlberg interviewed children in which they were presented with stories in which the characters face moral dilemmas. Children were asked what the characters in the dilemma should do, and why. According to him, children approach thinking about right and wrong differently at different ages. The young child, i.e. before 9 years of age, thinks in terms of external authority. According to her/him, actions are wrong because s/he is punished, and right because s/he is rewarded. As the child grows, i.e. by early adolescence, s/he develops moral reasoning through set of rules of others, such as parents or laws of the society. These rules are accepted by the children as their own. These are "internalised" in order to be virtuous and to win approval from others (not to avoid punishment). Children view rules as absolute guidelines, which should be followed. Moral thinking at this stage is relatively inflexible. As they grow, they gradually develop a personal moral code.

You have seen that by the end of childhood a more gradual growth rate enables the child to develop skills of coordination and balance. Language develops and the child can reason logically. Socially the child has become more involved in social systems, such as family and peer group. The next section traces changes in human development during adolescence and adulthood.

Activity 4.4

A patient is critically ill, hospitalised for many years and shows no improvement. Should the life support system of the patient be withdrawn? What is your view on euthanasia or "mercy killing" as it is sometimes called? Discuss with your teacher.

Challenges of Adolescence

The term adolescence derives from the Latin word *adolescere*, meaning "to grow into maturity". It is the transitional period in a person's life between childhood and adulthood. **Adolescence** is commonly defined as *the stage of life that begins at the onset of puberty, when sexual maturity, or the ability to reproduce is attained.* It has been regarded as a period of rapid change, both biologically and psychologically. Though the physical changes that take place during this stage are universal, the social and psychological dimensions of the adolescent's experiences depend on the cultural context. For example, in cultures where the adolescent years are

viewed as problematic or confusing, the adolescent will have very different experiences from someone who is in a culture, where adolescent years are viewed as beginning of adult behaviour and, therefore, undertaking responsible tasks. Although most societies have at least a brief period of adolescence, it is not universal across cultures.

Physical Development : Puberty or sexual maturity marks the end of childhood and signifies the beginning of adolescence, which is characterised by dramatic physical changes in both, growth rate, and sexual characteristics. However, puberty is not a sudden event, but is part of a gradual process. The hormones released during puberty result in the development of **primary** and **secondary sexual characteristics**. The primary sex characteristics include those directly related to reproduction and the secondary sex characteristics include features or signs of achieving sexual maturity. Pubertal changes in boys are marked by acceleration in growth, facial hair, and changes in voice. In girls, rapid growth in height usually begins about two years before **menarche**, the onset of menstruation. The growth spurt generally begins at the age of 12 or 13 for boys and at the age of 10 or 11 for girls. It is normal to have variations in the pubertal sequence. For example, among two boys (or two girls) of same chronological age, one may complete pubertal sequence before the other has begun it. Both genetics and environment play a part in this. For example, identical twins reach menarche closer in time than do fraternal twins; on an average, girls from affluent families go through menarche earlier than girls from poor families; and historical trends show that the age of menarche is declining in industrialised nations reflecting better nutrition and advances in medical care.

Physical development during adolescence is also accompanied by a number of psychological changes. Around puberty adolescents show an increase in interest in members of the opposite sex and in sexual matters and a new awareness of sexual feelings develops. This increased attention to sexuality is caused by factors such as individual's awareness of the biological changes taking place and the emphasis placed on sexuality by peers, parents, and society. Even then, many adolescents lack adequate knowledge or have misconceptions about sex and sexuality. Sex is a topic parents find difficult to discuss with children, so adolescents tend to become secretive about sexual concerns which make exchange of information and communication difficult. The concern over adolescent sexuality has become intense in recent times because of the risk of AIDS, and other sexually transmitted diseases.

The development of a sexual identity defines the sexual orientation and guides sexual behaviour. As such it becomes an important developmental task for adolescents. How did you think of yourself at the beginning of puberty? Adolescents are preoccupied with what they are like and develop individual images of what they look like. Another important developmental task during adolescence is accepting one's physical self/ maturity. Adolescents need to develop a realistic image of their physical appearance, which is acceptable to them. It is important to keep in mind that puberty also involves cognitive and social changes along with physical changes.

Cognitive Developmental Changes : Adolescents' thought becomes more abstract, logical, and idealistic; they become more capable of examining their own thoughts, others' thoughts, and what others are thinking about them. Adolescents' developing ability to reason gives them a new level of cognitive and social awareness. Piaget believed that *formal operational thought* appears between the age of 11 and 15. During this stage adolescent thinking expands beyond actual concrete experiences and they begin to think more in abstract terms and reason about them. In addition to being abstract, adolescent thought is also idealistic. Adolescents begin to think about ideal characteristics for themselves and others and compare themselves and others with these ideal standards. For example, they may think what an ideal parent is like and

compare their parents with these ideal standards. This may at times make adolescents wonder which of the new-found ideal standards they should adopt. In contrast to trial and error approach used by children in earlier stages of development, adolescent thinking becomes more systematic in solving problems — they think of possible courses of action, why something is happening the way it is, and systematically seek solutions. Piaget called this type of logical thinking — **hypothetical deductive reasoning**.

Logical thought also influences the development of moral reasoning. Social rules are not considered as absolute standards and moral thinking shows some flexibility. The adolescent recognises alternative moral courses, explores options, and then decides on a personal moral code. For example, should I smoke as everyone I know does? Is it ethical to copy answers in the examinations? This also lends the possibility of adolescents not following society's norms if they conflict with personal code of ethics. For example, individuals at this age might participate in a protest march for a cause rather than adhere/ conform to college norm.

Adolescents also develop a special kind of egocentrism. According to David Elkind, **imaginary audience** and **personal fable** are two components of adolescents' egocentrism. Imaginary audience is adolescent's belief that others are as preoccupied with them as they are about themselves. They imagine that people are always noticing them and are observing each and every behaviour of theirs. Imagine a boy who thinks that all will notice the ink spot on his shirt, or a girl with a pimple feels, all people would think how bad her skin is. It is this imaginary audience, which makes them extremely self-conscious. The personal fable is part of the adolescents' egocentrism that involves their sense of uniqueness. Adolescents' sense of uniqueness makes them think that no one understands them or their feelings. For example, an adolescent girl thinks that none can sense the hurt that she feels because of being betrayed by a friend. It is quite common to hear the adolescent say to the parents; 'you don't understand me'. To retain their sense of personal uniqueness they may weave stories filled with fantasy around them to create a world that is away from reality. Personal fables are often part of adolescent diaries.

Forming an Identity : You must have sought answers to questions such as : Who am I? Which subjects should I study? Do I believe in God? The answers to all these questions involve the quest to define one's sense of self or the search for **identity**. *Identity is who you are and what your values, commitments and beliefs are.* The primary task of adolescence is to establish an identity separate from the parents. During adolescence a detachment process enables the individual to develop a personalised set of beliefs that are uniquely her or his own. In the process of achieving an identity the adolescent could experience conflict with parents and within herself or himself. Those adolescents who can cope with the conflicting identities develop a new sense of self. Adolescents who are not able to cope with this identity crisis are confused. This "identity confusion", according to Erikson, can lead to individuals isolating themselves from peers and family; or they may lose their identity in the crowd. Adolescents on one hand, may desire independence but may also be afraid of it and show a great deal of dependence on their parents. Rapid fluctuations between self-confidence and insecurity are typical of this stage. Adolescents may at one time complain of being "treated like a baby" whereas on other occasions they may seek comfort by depending on their parents. Seeking an identity involves searching for continuity and sameness in oneself, greater responsibility and trying to get a clear sense of who one is, i.e. an identity.

The formation of identity during adolescence is influenced by several factors. The cultural background, family and societal values, ethnic background, and socio-economic status all prevail upon the adolescents' search for a place in society. Family relationships become less important as the adolescent spends more time outside

the home and develops a strong need for peer support and acceptance. Increased interactions with peers provide them with opportunities for refining their social skills and trying out different social behaviours. Peers and parents are dual forces having major influences on adolescents. At times conflicting situations with parents lead to increased identification with peers. But generally parents and peers serve complementary functions and fulfil different needs of the adolescents. Vocational commitment is another factor influencing adolescent identity formation. The question "What are you going to be when you grow up?", requires the ability to think about the future and to be able to set realistic and achievable goals. In some cultures freedom is given to the young people to choose an occupation, whereas in certain other cultures the option of making this choice is not given to the children. Here parents' decision is likely to be accepted by the children. What has been your experience while making a choice in the selection of subjects? Career counselling in schools offers information regarding appraisal of the students for various courses and jobs and provides guidance in making a decision about career choices.

Some Major Concerns : As adults when we reflect on our adolescent years and recall the conflicts, uncertainties, occasional loneliness, group pressures, we feel it was definitely a vulnerable period. During adolescence peer influence, new gained freedom, unresolved problems may create difficulties for many of you. Conforming to peer pressure can be both positive and negative. Adolescents are often confronted with decisions regarding smoking, drugs, alcohol, and breaking parental rules, etc. These decisions are taken without much regard to the effect they can have. Adolescents may face periods of uncertainty, loneliness, self-doubt, anxiety, and concern about themselves and their future, they are also likely to experience excitement, joy, and feelings of competence as they overcome the developmental challenges. You will now read about some of the major challenges faced by adolescents like delinquency, substance abuse, and eating disorders.

Delinquency : Delinquency refers to a variety of behaviours, ranging from socially unacceptable behaviour, legal offences, to criminal acts. Examples include truancy, running away from home, stealing or burglary or acts of vandalism. Adolescents with delinquency and behavioural problems tend to have a negative self-identity, decreased trust, and low level of achievement. Delinquency is often associated with low parental support, inappropriate discipline, and family discord. Often adolescents from communities characterised by poverty, unemployment, and having feelings of alienation from the middle class perform antisocial acts to gain attention and to be popular with their peers. However, most delinquent children do not remain delinquent forever. Change in their peer group, becoming more aware of their social responsibilities and developing feelings of self-worth, imitating positive behaviour of the role models, breaking negative attitudes, and overcoming poor self-concept help in reduction of delinquent behaviour.

Substance Abuse : Adolescent years are especially vulnerable to smoking, alcohol and drug abuse. Some adolescents take recourse to smoking and drugs as a way of coping with stress. This can interfere with the development of coping skills and responsible decision-making. The reasons for smoking and drug use could be peer pressure and the adolescents' need to be accepted by the group, or desire to act more like adults, or feel a need to escape the pressure of school work or social activities. The addictive powers of nicotine make it difficult to stop smoking. It has been found that adolescents who are more vulnerable to drugs, alcohol, and nicotine use, are impulsive, aggressive, anxious, depressive, and unpredictable, have low self-esteem, and low expectation for achievement. Peer pressure and the need to be with their peer group make the adolescent either go along with their demands to experiment with drugs, alcohol, and smoking or be ridiculed. Drug use if continued long enough can lead to

physiological dependency, i.e. addiction to drugs, alcohol or nicotine may seriously jeopardise the rest of the adolescents' lives. Positive relationships with parents, peers, siblings, and adults play an important role in preventing drug abuse. In India, a successful anti-drug programme is the Society for Theatre in Education Programme in New Delhi. It uses street performances to entertain people between 13 to 25 years of age while teaching them how to say no to drugs. The United Nations International Drug Control Programme (UNDCP) has chosen the programme as an example to be adopted by other non-governmental organisations in the region.

Eating Disorders : Adolescents' obsession with self, living in fantasy world and peer comparisons lead to certain conditions where they become obsessed with their own bodies. *Anorexia nervosa* is an eating disorder that involves relentless pursuit of thinness through starvation. It is quite common to see adolescents eliminate certain foods from their diets or to eat slimming foods only. The media also projects thinness, as the most desirable image and copying such fashionable image of thinness leads to anorexia nervosa. *Bulimia* is another form of an eating disorder in which the individual follows a binge-and-purge eating pattern. The bulimic goes on an eating binge, then purges by self-induced vomiting or using a laxative at times alternating it with fasting. Anorexia nervosa and bulimia are primarily female disorders more common in urban families.

Adulthood and Old Age

Adulthood

An adult is generally defined as someone who is responsible, mature, self-supporting, and well integrated into society. There is a variation in developing these attributes, which suggests that there is a shift in timing when an individual becomes an adult or assumes adult roles. Some people take up jobs along with their college studies or may get married and not pursue their studies. Others may continue to live with their parents even after getting married and being financially independent. The assumption of adult roles is directed by an individual's social context. The best time for some of the most important life events (i.e. marriage, job, having children) might be quite different in different cultures but within a culture there is similarity in the course of adult development.

In early adulthood, two major tasks are, exploring the possibilities for adult living and developing a stable life structure. The twenties represent the novice phase of adult development. Gradually, a transition from dependence to independence should occur. This could be marked by an image of the kind of life the young person wants, especially in terms of marriage and a career.

Career and Work : Earning a living, choosing an occupation, and developing a career are important themes for people in their twenties and thirties. Entering work life is a challenging event in anyone's life. There are apprehensions regarding different adjustments, proving one's competence, performance, dealing with competition, and coping with expectations both of the employers and oneself. It is also the beginning of new roles and responsibilities. Developing and evaluating a career becomes an important task of adulthood.

Marriage, Parenthood, and Family : The adjustments that young adults have to make when entering a marriage relate to knowing the other person if not known earlier, coping with each other's likes, dislikes, tastes, and choices. If both the partners are working, adjustments are required regarding sharing and performing roles and responsibilities at home.

In addition to getting married, becoming a parent can be a difficult and stressful transition in young adults, even though it is usually accompanied by the feeling of love for the baby. How adults experience parenting is affected by different situations such as the number of children in the family, the availability of social support, and the happiness or unhappiness of the married couple.

Death of a spouse or divorce creates a family structure in which a single parent either the mother or the father has to take up the responsibility of the children. In recent times, women are increasingly seeking employment outside the home thus creating another type of family in which both parents work. The stressors when both parents are working are quite the same as of a single working parent, namely, taking care of children, their school-work, illness, and coping with workload at home and in the office, etc. Despite the stresses associated with parenting, it provides a unique opportunity for growth and satisfaction and is perceived as a way of establishing concern and guiding the next generation.

Physical changes during middle ages are caused by maturational changes in the body. Though individuals may vary in the rate at which these changes occur, almost all middle-aged people notice gradual deterioration in some aspects of their physical functioning such as decline in vision, sensitivity to glare, hearing loss and changes in physical appearance (e.g., wrinkles, grey hair or thinning of hair, weight gain). Do cognitive abilities change during adulthood? It is believed that some cognitive abilities decline with age while others do not. Decline in memory is more in tasks involving long-term memory than short-term memory. For example, a middle-aged person can remember the telephone number immediately after s/he has heard it but may not remember it so efficiently after a few days. Memory tends to show greater decline, while wisdom may improve with age. Remember that individual differences exist in intelligence at every age and as not all children are exceptional, neither do all adults show wisdom.

Old Age

Just when "old age" begins, is not easy to determine. Traditionally, the age of retirement was linked to old age. Now that people are living longer, age of retiring from work is changing, and the cut-off point for the definition of "old age" is moving upward. Some of the challenges, which the aged have to cope with include retirement, widowhood, illness, or death in the family. The image of old age is changing in certain ways. Now there are people who have crossed seventy years of age or so and are quite active, energetic, and creative. They are competent and are therefore, valued by society in many walks of life. In particular, we have aged people in politics, literature, business, art and science. The myth of old age as an incapacitating and therefore, frightening phase of life is changing.

Of course, the experience of old age also depends on the socio-economic conditions, availability of health care, attitude of people, expectations of society and the available support system. Work is most important during early adult years, then family becomes most important and beyond that health becomes the most important issue in the person's life. Clearly, successful ageing for much of our adult life focuses on how effective we are at work, how loving our relationships are in our family, how good our friendships are, how healthy we are, and how cognitively fit we are.

Retirement from active vocational life is quite significant. Some people perceive retirement as a negative change. They consider it as a separation from an important source of satisfaction and self-esteem. Others view it as a shift in life with more time to pursue their own interests. It is seen that older adults who show openness to new experiences, more striving and achievement-oriented behaviour prefer to keep busy and are better adjusted.

Older adults also need to adjust to changes in the family structure and new roles (grand parenting) that have to be learnt. Children usually are busy in their careers and families and may set up independent homes. Older adults may depend on their children for financial support and to overcome their loneliness (after children have moved out). This might trigger-off feelings of hopelessness and depression in some people.

In old age feeling of loss of energy, and dwindling of health and financial assets, lead

to insecurity and dependency. The elderly tend to look towards others to lean on and to care for them. Indian culture favours dependency of elderly on their children, for old age needs caring. In fact, parents in most oriental cultures rear their children with the fond hope that they will care for them during old age. It is important to give the elderly a sense of security and belonging, a feeling that people care for them (especially in the time of crisis), and to remember that we all have to grow old one day.

Activity 4.5

Interview people from three different stages of life, for example, 20-35, 35-60 and over 60 years of age. Talk to them about:

a. Major transitions that have taken place in their lives.

b. How they feel these transitions have affected them?

Compare the events considered important in different groups.

Although death is more likely to occur in late adulthood, death can come at any point in development. The deaths, especially of children and younger adults, are often perceived to be more tragic than those of others. In children and younger adults, death is more likely to occur because of accidents but in older adults it is more likely to occur because of chronic disease. The death of a spouse is usually seen as the most difficult loss. Those left behind after the death of their partner suffer deep grief, cope with loneliness, depression, financial loss and are also at risk of many health related problems. Widows by far out number widowers, because studies show that women live longer than men and tend to marry men older than themselves. During such times, support from children, grandchildren, and friends can help the individual cope with the loss of spouse.

People in different cultures view death differently. In the Gond culture in our country, it is believed that death is caused by magic and demon. In the Tanala culture of Madagascar, natural forces are thought to cause death. Human development as you have read in this chapter thus, helps you to understand the influence of various factors in an individual's lifetime.

Key Terms

Adolescence, Animism, Attachment, Centration, Cephalocaudal trend, Concrete operational stage, Deductive thought, Development, Egocentrism, Evolution, Gender, Identity, Infancy, Maturation, Menarche, Motor development, Object permanence, Operations, Phenotype, Prenatal period, Preoperational stage, Primary sex characteristics, Proximodistal trend, Puberty, Reflexes, Secondary sex characteristics, Self, Sensorimotor stage, Teratogens

Summary

- *Prenatal development may be affected by maternal malnutrition, maternal drug use and some maternal illnesses.*
- *Motor development follows cephalocaudal and proximodistal trends. Early motor development depends on both maturation and learning.*
- *Cultural variations in child rearing can affect the patterns of attachment between the child and the caregiver.*
- *According to Piaget's theory of cognitive development, the main characteristics of sensorimotor stage is the child's gradual recognition of the permanence of objects. The preoperational stage is marked by certain deficiencies in thinking such as centration, irreversibility, and egocentrism.*

- *During the concrete operations stage, children develop the ability to perform operations on mental representations, making them capable of conservation. The stage of formal operations is more abstract, systematic, and develops logical thought.*
- *According to Kohlberg, moral reasoning progresses through three levels that are related to age and determined by cognitive development.*
- *The growth spurt at puberty is a prominent event involving the development of reproductive maturity and secondary sex characteristics. According to Erikson, the key challenge of adolescence is to make some progress towards a sense of identity.*
- *During adulthood personality is marked by both stability and change. Many landmarks in adult development involve transitions in family relationships, including adjustment to marriage, parenthood, and children leaving home.*
- *Age-related physical transitions during adulthood include changes in appearance, memory, and in the cognitive domain.*

Review Questions

1. What is development? How is it different from growth and maturation?
2. Describe the main features of life-span perspective on development.
3. What are developmental tasks? Explain by giving examples.
4. 'Environment of the child has a major role in the development of the child'. Support your answer with examples.
5. How do socio-cultural factors influence development?
6. Discuss the cognitive changes taking place in a developing child.
7. Attachment bonds formed in childhood years have long-term effects. Explain taking examples from daily life.
8. What is adolescence? Explain the concept of egocentrism.
9. What are the factors influencing the formation of identity during adolescence? Support your answer with examples.
10. What are the challenges faced by individuals on entry to adulthood?

Project Ideas

1. Think of your experiences during the last 2-3 years and answer the following : Did you have confrontations with your parents? What were the main problems? How did you solve your problems, and whose help did you seek? Compare your list with your classmates. Are there any similarities? Can you now think of better ways of solving the problems faced by you?
2. Develop a script from a preoperational (4-7 years old) child's point of view for playing with friends. Develop the same script for an adolescent. How do these scenarios differ? How are roles played by your friends different?

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Chapter 5

Sensory, Attentional and Perceptual Processes

After reading this chapter, you would be able to

- understand the nature of sensory processes,
- explain the processes and types of attention,
- analyse the problems of form and space perception,
- examine the role of socio-cultural factors in perception, and
- reflect on sensory, attentional and perceptual processes in everyday life.

Contents

Introduction
Knowing the World
Nature and Varieties of Stimulus
Sense Modalities
Visual Sensation
Other Human Senses (Box 5.1)
Auditory Sensation
Attentional Processes
Selective Attention
Divided Attention (Box 5.2)
Sustained Attention
Span of Attention (Box 5.3)
Attention Deficit Hyperactivity Disorder (Box 5.4)
Perceptual Processes
Processing Approaches in Perception
The Perceiver
Principles of Perceptual Organisation
Perception of Space, Depth, and Distance
Monocular Cues and Binocular Cues
Perceptual Constancies
Illusions
Socio-Cultural Influences on Perception

Key Terms
Summary
Review Questions
Project Ideas

The quality of life is determined by its activities.

– Aristotle

Introduction

In the previous chapters you have already learnt how we respond to various stimuli present in the external and internal environment with the help of our receptors. While some of these receptors are clearly observable (for example, eyes or ears), others lie inside our body, and are not observable without the help of electrical or mechanical devices. This chapter will introduce you to various receptors that collect a variety of information from the external and internal worlds. The focus will be particularly on the structure and function of eye and ear, including some interesting processes associated with vision and audition. You will also know some important things about attention, which helps us to notice and register the information that our sense organs carry to us. Different types of attention will be described along with the factors that influence them. At the end, we will discuss the process of perception that allows us to understand the world in a meaningful way. You will also have an opportunity to know how we are sometimes deceived by certain types of stimuli such as figures and pictures.

Knowing the World

The world in which we live is full of variety of objects, people, and events. Look at the room you are sitting in. You will find so many things around. Just to mention a few, you may see your table, your chair, your books, your bag, your watch, pictures on the wall and many other things. Their sizes, shapes, and colours are also different. If you move to other rooms of your house, you will notice several other new things (e.g., pots and pans, almirah, TV). If you go beyond your house, you will find still many more things that you generally know about (trees, animals, buildings). Such experiences are very common in our day-to-day life. We hardly have to make any efforts to know them.

If someone asks you, "How can you say that these various things exist in your room, or house, or in the outside environment?", you will most probably answer that you see or experience them all around you. In doing so, you are trying to tell the person that the knowledge about various objects becomes possible with the help of our sense organs (e.g., eyes, ears). These organs collect information not only from the external world, but also from our own body. The information collected by our sense organs forms the basis of all our knowledge. The sense organs register several kinds of information about various objects. However, in order to be registered, the objects and their qualities (e.g., size, shape, colour) must be able to draw our attention. The registered information must also be sent to the brain that constructs some meaning out of them. Thus, our knowledge of the world around us depends on three basic processes, called sensation, attention, and perception. These processes are highly interrelated; hence, they are often considered as different elements of the same process, called cognition.

Nature and Varieties of Stimulus

The external environment that surrounds us contains a wide variety of stimuli. Some of them can be seen (e.g., a house), while some can be heard only (e.g., music). There are several others that we can smell (e.g., fragrance of a flower) or taste (e.g., sweets). There are still others that we can experience by touching (e.g., softness of a cloth). All these stimuli

provide us with various kinds of information. We have very specialised sense organs to deal with these different stimuli. As human beings we are bestowed with a set of seven sense organs. These sense organs are also known as sensory receptors or information gathering systems, because they receive or gather information from a variety of sources. Five of these sense organs collect information from the external world. These are eyes, ears, nose, tongue, and skin. While our eyes are primarily responsible for vision, ears for hearing, nose for smell, and tongue for taste, skin is responsible for the experiences of touch, warmth, cold, and pain. Specialised receptors of warmth, cold, and pain are found inside our skin. Besides these five external sense organs, we have also got two deep senses. They are called kinesthetic and vestibular systems. They provide us with important information about our body position and movement of body parts related to each other. With these seven sense organs, we register ten different variety of stimuli. For example, you may notice whether a light is bright or dim, whether it is yellow, red or green, and so on. With sound you may notice whether it is loud or faint, whether it is melodious or distracting, and so on. These different qualities of stimuli are also registered by our sense organs.

Sense Modalities

Our sense organs provide us with first-hand information about our external or internal world. The initial experience of a stimulus or an object registered by a particular sense organ is called sensation. It is a process through which we detect and encode a variety of physical stimuli. Sensation also refers to immediate basic experiences of stimulus attributes, such as "hard", "warm", "loud", and "blue", which result from appropriate stimulation of a sensory organ. Different sense organs deal with different forms of stimuli and serve different purposes. Each sense organ is highly specialised for dealing with a particular kind of information. Hence, each one of them is known as a sense modality.

Functional Limitations of Sense Organs

Before we move on to a discussion of sense organs, it is important to note that our sense organs function with certain limitations. For example, our eyes cannot see things which are very dim or very bright. Similarly our ears cannot hear very faint or very loud sounds. The same is true for other sense organs also. As human beings, we function within a limited range of stimulation. For being noticed by a sensory receptor, a stimulus has to be of an optimal intensity or magnitude. The relationship between stimuli and the sensations they evoke has been studied in a discipline, called **psychophysics**.

In order to be noticed a stimulus has to carry a minimum value or weight. The minimum value of a stimulus required to activate a given sensory system is called **absolute threshold** or **absolute limen** (AL). For example, if you add a granule of sugar to a glass of water, you may not experience any sweetness in that water. Addition of a second granule to water may also not make it taste sweet. But if you go on adding sugar granules one after another, there will come a point when you will say that the water is now sweet. The minimum number of sugar granules required to say that the water is sweet will be the AL of sweetness.

It may be noted at this point that the AL is not a fixed point; instead it varies considerably across individuals and situations depending on the people's organic conditions and their motivational states. Hence, we have to assess it on the basis of a number of trials. The number of sugar granules that may produce the experience of "sweetness" in water on 50 per cent of occasions will be called the AL of sweetness. If you add more number of sugar granules, the chances are greater that the water will be reported more often as sweet than plain.

As it is not possible for us to notice all stimuli, it is also not possible to differentiate between all stimuli. In order to notice two stimuli as different from each other, there has to be some minimum difference between the

value of those stimuli. The smallest difference in the value of two stimuli that is necessary to notice them as different is called **difference threshold** or **difference limen** (DL). To understand it, we may continue with our "sugar water" experiment. As we have seen, the plain water is experienced as sweet after the addition of certain number of sugar granules. Let us remember this sweetness. The next question is: how many sugar granules will be needed in the water in order to experience its sweetness as different from the previous sweetness. Go on adding sugar granules one after another tasting the water each time. After addition of a few granules, you will notice at a point that the water is now sweeter than the previous one. The number of sugar granules added to the water to generate an experience of sweetness that is different from the previous sweetness on 50 per cent of the occasions will be called the DL of sweetness. Thus, difference threshold is the minimum amount of change in a physical stimulus that is capable of producing a sensation difference on 50 per cent of the trials.

You may realise by now that understanding of sensations is not possible without understanding the AL and DL of different types of stimuli (for example, visual, auditory), but that is not enough. Sensory processes do not depend only on the stimulus characteristics. Sense organs and the neural pathways connecting them to various brain centers also play a vital role in this process. A sense organ receives the stimulus and encodes it as an electrical impulse. For being noticed this electrical impulse must reach the higher brain centers. Any structural or functional defect or damage in the receptor organ, its neural pathway, or the concerned brain area may lead to a partial or complete loss of sensation.

Visual Sensation

Among all sense modalities, vision is the most highly developed in human beings. Various estimates indicate that we use it in approximately 80 per cent of our transactions with the external world. Audition and other senses also contribute significantly to information gathering from the external world. We shall discuss vision and audition in some detail. The main features of other senses can be found in Box 5.1.

Visual sensation starts when light enters the eyes and stimulates our visual receptors. Our eyes are sensitive to a spectrum of light, the wavelength of which ranges from 380 nm to 780 nm (nm refers to nanometer, which is one billionth of a meter). No sensation is registered beyond this range of light.

The Human Eye

A diagram of the human eye is shown in Figure 5.1. As you can see, our eye is made up of three layers. In the outer layer, there is a transparent **cornea** and a tough **sclera** that surrounds the rest of the eye. It protects the eye and maintains its shape. The middle layer is called **choroid**, which is richly supplied with blood vessels. The inner layer is known as **retina**. It contains the photoreceptors (rods and cones) and an elaborate network of interconnecting neurons.

The eye is generally compared with a camera. For example, the eye and camera have a lens. The **lens** divides the eye into two unequal chambers, namely **aqueous chamber** and **vitreous chamber**. The aqueous chamber is located between the cornea and the lens. It is smaller in size and is filled with a water-like substance, called **aqueous humor**. The vitreous chamber is located between the lens and the retina. It is filled with a jelly like protein, called **vitreous humor**. These fluids help in holding the lens at its appropriate place and in proper shape. They also allow enough flexibility for the occurrence of accommodation — a process through which the lens changes its shape in order to focus the objects at varying distances. This process is regulated by **ciliary muscles**, which are attached to the lens. These muscles flatten the lens to focus the distant objects and thicken it to focus the near objects. Like a camera, the eye also has a mechanism to control the amount of light

Box 5.1 Other Human Senses

Besides vision and audition, there are other senses that enrich our perceptions. For example, an orange looks attractive not only because of it is colour but also because it has got a special flavour and taste. These other senses are briefly described here.

1. ***Smell*** : *The stimulus for smell sensation consists of molecules of various substances contained in the air. They enter the nasal passage where they dissolve in moist nasal tissues. This brings them in contact with receptor cells contained in olfactory epithelium. Human beings possess about 50 million of these receptors, whereas dogs possess more than 200 million of these receptors. Nevertheless, our ability to detect smell is impressive. It is indicated that human beings can recognise and distinguish among approximately 10,000 different odours. The sense of smell also shows sensory adaptation like other senses.*
2. ***Taste*** : *The sensory receptors for taste are located inside small bumps on the tongue, known as papillae. In each papilla there is a cluster of taste buds. Human beings possess almost 10,000 taste buds. While people claim to distinguish a large number of flavours in food, there are only four basic tastes, namely sweet, sour, bitter and salty. How is it then that we perceive many more? The answer is that we are aware not only of the taste of the food, but also of its smell, its texture, its temperature, its pressure on our tongue, and many other sensations. When these factors are removed, we are left with only four basic tastes. Besides, the combination of different flavours in varied proportions results in a different kind of flavour which may be quite unique.*
3. ***Touch and other skin senses*** : *Skin is a sensory organ that produces sensations of touch (pressure), warmth, cold, and pain. In our skin there are specialised receptors for each one of these sensations. The receptors of touch are not evenly distributed in our skin. That is why some areas of our body (e.g., face, fingertips) are more sensitive than others (e.g., legs). Pain sensation has no specific stimulus. Hence, determining its mechanism has been fairly difficult.*
4. ***The Kinesthetic system*** : *Its receptors are found primarily in joints, ligaments, and muscles. This system gives us information about the location of our body parts in relation to each other, and allows us to perform simple (e.g., touching one's nose) and complex movements (e.g., dancing). Our visual system provides a great deal of help in this respect.*
5. ***The Vestibular system*** : *This system gives us information about our body position, movement, and acceleration — the factors that are critical for maintaining our sense of balance. The sensory organs of this sense are located in the inner ear. While vestibular sacs inform us of our body positions, the semicircular canals inform us about our movements and acceleration.*

entering into it. The **iris** serves this purpose. It is a disc-like coloured membrane lying between the cornea and the lens. It controls the amount of light entering the eye by regulating pupil dilation. In dim light the pupil dilates; in bright light it contracts.

Retina is the inner most layer of an eye. It is made up of five types of photosensitive cells among which rods and cones are most important. **Rods** are the receptors for scotopic vision (night vision). They operate at low intensities of light, and lead to achromatic (colourless) vision. **Cones** are the receptors for photopic (day light) vision. They operate at high levels of illumination, and lead to chromatic (colour) vision. Each eye contains about 100 million rods and about 7 million cones. The cones are highly concentrated in the central region of the retina surrounding the **fovea**, which is a small circular region of the size of a pea. It is also known as the **yellow spot**. It is the region of maximum visual acuity. Besides photoreceptors, retina also contains a bundle of axons of a cell (called ganglion cell) that forms the **optic nerve**, which leads to the brain.

Working of the Eye

Passing through conjunctiva, cornea, and pupil, the light enters the lens, which focuses

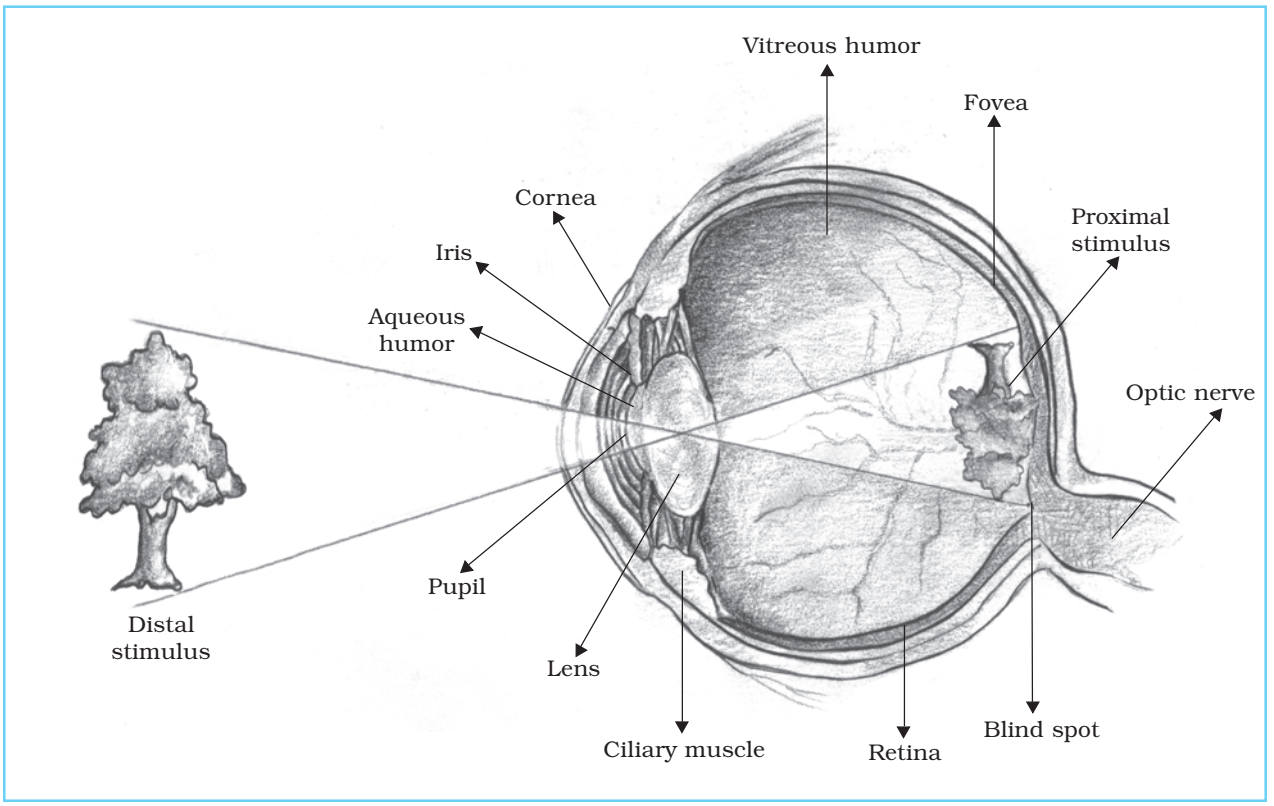

Fig.5.1 : Structure of the Human Eye

it on to the retina. Retina is divided into two parts: the nasal half and the temporal half. The inner half portion of the eye (towards the nose), taking the center of fovea as mid-point, is called the nasal half. The outer half portion of the eye (towards the temple) from the center of fovea is called the temporal half. Light from the right visual field stimulates the left half of each eye (i.e. the nasal half of the right eye and the temporal half of the left eye), and light from the left visual field stimulates the right half of each eye (i.e. the nasal half of the left eye and the temporal half of the right eye). An inverted image of the object is formed on the retina. The neural impulse is transmitted to the visual cortex through the optic nerve where the image is re-inverted and processed. You can see in Fig.5.1 that the optic nerve leaves the retina from the area that has no photoreceptors. In this area visual sensitivity is completely absent. Therefore, it is called the **blind spot**.

Adaptation

The human eye can function at a very large range of light intensities. Sometimes we have to undergo a rapid change in illumination levels. For example, when we go to a matinee show movie, we find it difficult to see things in the hall on entering into it. However, after spending about 15 to 20 minutes there, we are able to see everything. After the show when we go out into the open, we find the light outside the hall too bright to see things, or sometimes even to keep our eyes open. However, within a minute or so we feel comfortable, and are able to see things properly. This adjustment is faster than the one made on entering the hall. The process of getting adjusted to different intensities of light is called 'visual adaptation'.

Light adaptation refers to the process of adjusting to bright light after exposure to dim light. This process takes nearly a minute or two. On the other hand, **dark adaptation**

refers to the process of adjusting to a dimly illuminated environment after exposure to bright light. This may take half an hour or even longer depending on the previous level of exposure of the eye to light. There are certain ways in which these processes can be facilitated. An interesting activity is given below to demonstrate this process to you.

Activity 5.1

Move from a lighted area to a dark room and note how much time you take to see things clearly in that room.

Next time put on red goggles while you stay in the lighted place. Then move into the dark room and note how much time you take to see things clearly in that room.

You will notice that the use of red goggles has greatly reduced the time required for dark adaptation.

Do you know why has this happened? Discuss with your friends and the teacher.

Photochemical Basis of Light and Dark Adaptation : You may wonder why the light and dark adaptations take place. According to the classical view, light and dark adaptations occur due to certain photochemical processes. The rods have a photo-sensitive chemical substance, called **rhodopsin** or visual purple. By the action of light the molecules of this chemical substance get bleached or broken down. Under such conditions the light adaptation takes place in the eyes. On the other hand, the dark adaptation is achieved by the removal of light, and thereby allowing for restorative processes to regenerate the pigment in the rods with the help of vitamin A. The regeneration of rhodopsin in rods is a time consuming process. That is why dark adaptation is a slower process than light adaptation. It has been found that people who suffer from vitamin A deficiency do not achieve dark adaptation at all, and find it really difficult to move in the dark. This condition is generally known as night blindness. A parallel chemical believed to be found in cones is known as *iodopsin*.

Colour Vision

In our interaction with the environment we not only experience a variety of objects, but also their colours. It may be noted that colour is a psychological property of our sensory experience. It is created when our brain interprets the information received from the external world. It may be remembered that light is described physically in terms of wavelength, not in terms of colour. As we have read earlier, the visible spectrum is a range of energy (380-780 nm) that our photoreceptors can detect. The energy lower or higher than the visible spectrum is harmful to the eyes. The sun light is a perfect mixture of seven colours just like a rainbow. The colours observed are violet, indigo, blue, green, yellow, orange, and red, abbreviated as 'VIBGYOR'.

The Dimensions of Colour

A person with normal colour vision can distinguish more than seven million different shades of colour. Our experiences of colour can be described in terms of three basic dimensions, called hue, saturation, and brightness. **Hue** is a property of chromatic colours. In simple words, it refers to the name of the colour, e.g., red, blue, and green. Hue varies with wavelength, and each colour is identified with a specific wavelength. For example, blue has a wavelength of about 465 nm, and green of about 500 nm. Achromatic colours like black, white or grey are not characterised by hues. **Saturation** is a psychological attribute that refers to the relative amount of hue of a surface or object. The light of single wavelength (monochromatic) appears to be highly saturated. As we mix different wavelengths, the saturation decreases. The colour grey is completely unsaturated. **Brightness** is the perceived intensity of light. It varies across both chromatic and achromatic colours. White and black represent the top and bottom of the brightness dimension. White has the highest degree of brightness, whereas black has the lowest degree.

Colour Mixtures

There is an interesting relationship among colours. They form complementary pairs. When mixed in correct proportions the complementary colours yield an achromatic grey or white. Examples of complementary colours are red-green and yellow-blue. Red, green and blue are called **primary colours**, because on mixing, the light of these three colours can produce almost any colour. The most common example is the television screen. It contains spots of blue, red and green colours. The combinations of these three produce different colours and shades that we see on the TV screen.

After Images

This is quite an interesting phenomenon related to visual sensations. The effect of a visual stimulus persists for some time even after the removal of that stimulus from the visual field. This effect is called after image. After images are positive and negative. **Positive after images** resemble the original stimulus in terms of hue, saturation, and brightness. They usually occur after a brief intense stimulation of dark adapted eyes. On the other hand, **negative after images** appear in complementary colours. These images appear when a person stares at the patch of a particular colour for at least 30 seconds, and then transfers the gaze to a neutral background (e.g., a white or grey surface). If the person looks at the blue colour, the negative after image will appear in yellow. Similarly, a red stimulus will yield a negative after image of green colour.

Auditory Sensation

Audition or hearing is also an important sense modality that carries great value for us. It provides us with reliable spatial information. Besides orienting us to certain objects or individuals, it plays a vital role in spoken communication also. Auditory sensation begins when sound enters our ear and stimulates the chief organs of hearing.

The Human Ear

Ear is the primary receptor of auditory stimuli. While its well-known function is hearing, it also helps us in maintaining our body balance. The structure of an ear is divided into three segments, called the external ear, the middle ear, and the inner ear (Fig.5.2).

External Ear : It contains two main structures, namely *pinna* and *auditory meatus*. Pinna is a cartilaginous funnel-shaped structure that collects sound waves from the surroundings. Auditory meatus is a canal protected by hair and wax that carries sound waves from pinna to the *tympanum* or *ear drum*.

Middle Ear : The middle ear starts with *tympanum*, a thin membrane highly sensitive to sound vibrations. This is followed by the *tympanic cavity*. It is connected to the pharynx with the help of **Eustachian tube**, which maintains the air pressure in tympanic cavity. From the cavity the vibrations pass to three ossicles known as *malleus* (hammer), *incus* (anvil), and *stapes* (stirrup). They increase the intensity of sound vibrations about 10 times, and send them to the inner ear.

Inner Ear : The inner ear has a complicated structure known as *membranous labyrinth*, which is encapsulated in a bony shell called *bony labyrinth*. A lymph-like fluid is found in the space between bony labyrinth and membranous labyrinth. This is called *perilymph*.

The bony labyrinth has three **semi-circular canals** at right angle to each other, a cavity, called **vestibule**, and a coiled structure, called **cochlea**. The semicircular canals have fine hair cells, which are highly sensitive to postural changes as well as changes in the body orientation. Inside the bony cochlea, there is a membranous cochlea, which is also known as **scala media**. It is filled with endolymph, and has a spirally coiled membrane, called **basilar membrane**. It has got fine hair cells arranged in a series to form the **organ of corti**. This is the main organ for hearing.

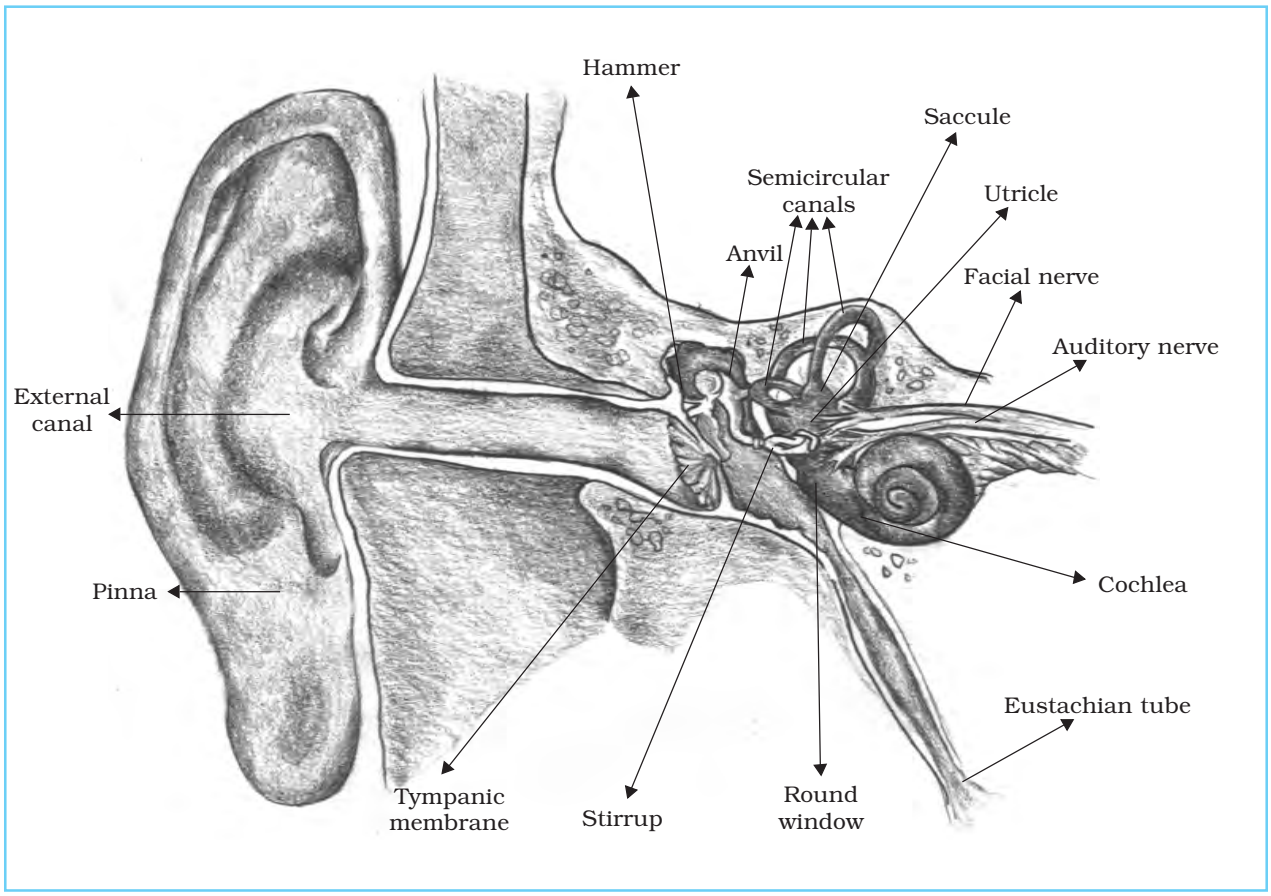

Fig.5.2 : Structure of the Human Ear

Working of the Ear

Pinna collects the sound vibrations and serves them to the tympanum through the auditory meatus. From the tympanic cavity the vibrations are transferred to the three ossicles, which increase their strength and transmit them to the inner ear. In the inner ear the cochlea receives the sound waves. Through vibrations the endolymph is set in motion, which also vibrates the organ of corti. Finally, the impulses are sent to the auditory nerve, which emerges at the base of cochlea and reaches the auditory cortex where the impulse is interpreted.

Sound as a Stimulus

We all know that sound is the stimulus for ears. It results from pressure variations in the external environment. Any physical movement disturbs the surrounding medium (i.e. air), and pushes the air molecules back and forth. This results in changes in pressure that spread outward in the form of sound waves, travelling at a rate of about 1,100 ft/sec. These changes travel in waves much like the ripples set up by a stone thrown into a pond. When these sound waves strike our ears, they initiate a set of mechanical pressure changes that ultimately trigger the auditory receptors.

The simplest kind of sound wave is one that causes successive pressure changes over time in the form of a single repeating sine wave (Fig.5.3). Sound waves vary in amplitude as well as in wavelength. **Amplitude** is a general measure of stimulus magnitude. It is the amount of change in pressure, i.e. the extent of displacement of the molecules from the position of rest. In Fig.5.3 the amplitude of sound wave is represented as the distance of

the crest or trough from its mean position. **Wavelength** is the distance between the two crests. Sound waves are basically formed due to alternate compression and decompression (rarefaction) of air molecules. A complete change in pressure from compression to rarefaction and again to compression makes a cycle of the wave.

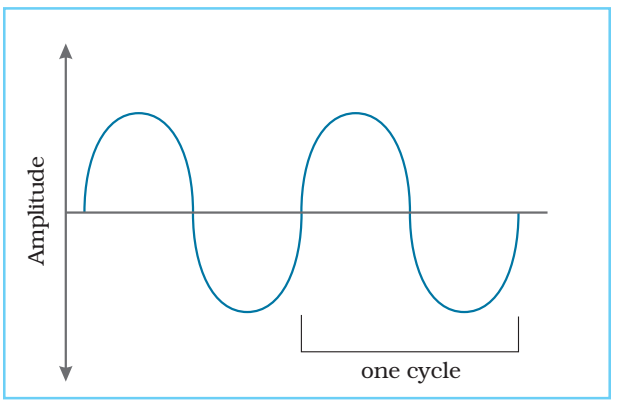

Fig.5.3 : Sound Waves

Sound waves are described in terms of their frequency, which is measured in terms of cycles per second. Its unit is called Hertz (Hz). Frequency and wavelength have an inverse relationship. When the wavelength increases, the frequency decreases, and when the wavelength decreases, the frequency increases. Amplitude and frequency both are physical dimensions. Besides these, there are three psychological dimensions of sound, namely loudness, pitch and timbre.

Loudness of the sound is determined by its amplitude. Sound waves with large amplitude are perceived as loud; those with small amplitude are perceived as soft. Loudness is measured in decibels (db). **Pitch** refers to highness or lowness of a sound. The seven notes used in Indian classical music represent a gradual increase in their pitch. Frequency determines the pitch of a sound wave. The higher the frequency, the higher will be the pitch. The range of hearing is generally 20 Hz-20,000 Hz. **Timbre** refers to the nature or quality of a sound. For example, the sound of a car engine and a person talking differ with respect to quality or timbre. The timbre of a sound reflects the complexity of its sound waves. Most of the sounds found in natural environments are complex.

Activity 5.2

Vision and hearing are generally believed to be the two most highly prized senses. What would your life be if you lost any one of your senses? Which sense would you find more traumatic to lose? Why? Think and write down.

What if you could magically improve the performance of one of your senses, which sense would you choose to improve? Why? Could you improve the performance of this one sense without magic? Think and write down.

Discuss with your teacher.

Attentional Processes

In the previous section we have discussed some sensory modalities that help us in collecting information from the external world and also from our internal system. A large number of stimuli impinge upon our sense organs simultaneously, but we do not notice all of them at the same time. Only a selected few of them are noticed. For example, when you enter your classroom you encounter several things in it, such as doors, walls, windows, paintings on walls, tables, chairs, students, schoolbags, water bottles, and so on, but you selectively focus only on one or two of them at one time. *The process through which certain stimuli are selected from a group of others is generally referred to as attention.*

At this point it may be noted that besides selection, attention also refers to several other properties like alertness, concentration, and search. Alertness refers to an individual's readiness to deal with stimuli that appear before her/him. While participating in a race in your school, you might have seen the participants on the starting line in an alert state waiting for the whistle to blow in order to run. Concentration refers to focusing of awareness on certain specific objects while excluding others for the moment. For example, in the classroom, a student concentrates on

the teacher's lecture and ignores all sorts of noises coming from different corners of the school. In search an observer looks for some specified subset of objects among a set of objects. For example, when you go to fetch your younger sister and brother from the school, you just look for them among innumerable boys and girls. All these activities require some kind of effort on the part of people. Attention in this sense refers to "effort allocation".

Attention has a focus as well as a fringe. When the field of awareness is centered on a particular object or event, it is called focus or the focal point of attention. On the contrary, when the objects or events are away from the center of awareness and one is only vaguely aware of them, they are said to be at the fringe of attention.

Attention has been classified in a number of ways. A process-oriented view divides it into two types, namely **selective** and **sustained**. We will briefly discuss the main features of these types of attention. Sometimes we can also attend to two different things at the same time. When this happens, it is called **divided attention**. Box 5.2 describes when and how the division of attention is possible.

Selective Attention

Selective attention is concerned mainly with the selection of a limited number of stimuli or objects from a large number of stimuli. We have already indicated that our perceptual system has a limited capacity to receive and process information. This means that it can deal only with a few stimuli at a given moment of time. The question is, which of those stimuli will get selected and processed? Psychologists have identified a number of factors that determine the selection of stimuli.

Factors Affecting Selective Attention

Several factors influence selective attention. These generally relate to the characteristics of stimuli and the characteristics of individuals. They are generally classified as "external" and "internal" factors.

External factors are related to the features of stimuli. Other things held constant, the size, intensity, and motion of stimuli appear to be important determinants of attention. Large, bright, and moving stimuli easily catch our attention. Stimuli, which are novel and moderately complex, also easily get into our focus. Studies indicate that human photographs are more likely to be attended to than the photographs of inanimate objects. Similarly, rhythmic auditory stimuli are more readily attended to than verbal narrations. Sudden and intense stimuli have a wonderful capacity to draw attention.

Internal factors lie within the individual. These may be divided into two main categories, viz. motivational factors and cognitive factors. **Motivational factors** relate to our biological

Box 5.2 Divided Attention

In day-to-day life we attend to several things at the same time. You must have seen people driving a car and talking to a friend, or attending to phone calls on a mobile set, or putting on sunglasses, or listening to music. If we watch them closely, we will notice that they are still allocating more effort to driving than to other activities, even though some attention is given to other activities. It indicates that on certain occasions attention can be allocated to more than one thing at the same time. However, this becomes possible only with highly practiced activities, because they become almost automatic and require less attention to perform than new or slightly practiced activities.

***Automatic processing** has three main characteristics; (i) It occurs without intention, (ii) It takes place unconsciously, and (iii) It involves very little (or no) thought processes (e.g., we can read words or tie our shoelaces without giving any thought to these activities).*

or social needs. When we are hungry, we notice even a faint smell of food. A student taking an examination is likely to focus on a teacher's instructions more than other students. **Cognitive factors** include factors like interest, attitude, and preparatory set. Objects or events, which appear interesting, are readily attended by individuals. Similarly we pay quick attention to certain objects or events to which we are favourably disposed. Preparatory set generates a mental state to act in a certain way and readiness of the individual to respond to one kind of stimuli and not to others.

Theories of Selective Attention

A number of theories have been developed to explain the process of selective attention. We will briefly discuss three of these theories.

Filter theory was developed by Broadbent (1956). According to this theory, many stimuli simultaneously enter our receptors creating a kind of "bottleneck" situation. Moving through the short-term memory system, they enter the selective filter, which allows only one stimulus to pass through for higher levels of processing. Other stimuli are screened out at that moment of time. Thus, we become aware of only that stimulus, which gets access through the selective filter.

Filter-attenuation theory was developed by Triesman (1962) by modifying Broadbent's theory. This theory proposes that the stimuli not getting access to the selective filter at a given moment of time are not completely blocked. The filter only attenuates (weakens) their strength. Thus some stimuli manage to escape through the selective filter to reach higher levels of processing. It is indicated that personally relevant stimuli (e.g., one's name in a collective dinner) can be noticed even at a very low level of sound. Such stimuli, even though fairly weak, may also generate response occasionally by slipping through the selective filter.

Multimode theory was developed by Johnston and Heinz (1978). This theory believes that attention is a flexible system that allows selection of a stimulus over others at three stages. At stage one the sensory representations (e.g., visual images) of stimuli are constructed; at stage two the semantic representations (e.g., names of objects) are constructed; and at stage three the sensory and semantic representations enter the consciousness. It is also suggested that more processing requires more mental effort. When the messages are selected on the basis of stage one processing (early selection), less mental effort is required than when the selection is based on stage three processing (late selection).

Sustained Attention

While selective attention is mainly concerned with the selection of stimuli, sustained attention is concerned with concentration. It

Box 5.3 Span of Attention

Our attention has a limited capacity to receive stimuli. The number of objects one can attend to at a brief exposure (i.e. a fraction of a second) is called "span of attention" or "perceptual span". More specifically, the span of attention refers to the amount of information an observer can grasp from a complex array of stimuli at a single momentary exposure. This can be determined by the use of an instrument, called "tachistoscope". On the basis of several experiments, Miller has reported that our span of attention varies within the limit of seven plus or minus two. This is popularly known as the "magic number". It means that at a time, people can attend to a set of five to seven numbers, which can be extended to nine or more under exceptional conditions. That is perhaps the reason why motorbikes or cars are given a number plate that contains only four digit numbers with some alphabets. In case of violation of driving rules a traffic police can easily read and note these numbers along with the alphabets.

refers to our ability to maintain attention on an object or event for longer durations. It is also known as "vigilance". Sometimes people have to concentrate on a particular task for many hours. Air traffic controllers and radar readers provide us with good examples of this phenomenon. They have to constantly watch and monitor signals on screens. The occurrence of signals in such situations is usually unpredictable, and errors in detecting signals may be fatal. Hence, a great deal of vigilance is required in those situations.

Factors Influencing Sustained Attention

Several factors can facilitate or inhibit an individual's performance on tasks of sustained attention. **Sensory modality** is one of them. Performance is found to be superior when the stimuli (called signals) are auditory than when they are visual. **Clarity of stimuli** is another factor. Intense and long lasting stimuli facilitate sustained attention and result in better performance. **Temporal uncertainty** is a third factor. When stimuli appear at regular intervals of time they are attended better than when they appear at irregular intervals. **Spatial uncertainty** is a fourth factor. Stimuli that appear at a fixed place are readily attended, whereas those that appear at random locations are difficult to attend.

Attention has several practical implications. The number of objects one can readily attend to in a single glance is used to design the number plates of motorbikes and cars so that the traffic police can easily notice them in the case of traffic rule violations (Box 5.3). A number of children fail to perform well in school simply due to the problem of attention. Box 5.4 presents some interesting information about a disorder of attention.

Box 5.4 Attention Deficit Hyperactivity Disorder (ADHD)

This is a very common behavioural disorder found among children of the primary school age. It is characterised by impulsivity, excessive motor activity, and an inability to attend. The disorder is more prevalent among boys than among girls. If not managed properly, the attention difficulties may persist into adolescence or adult years. Difficulty in sustaining attention is the central feature of this disorder, which gets reflected in several other domains of the child. For example, such children are highly distractible; they do not follow instructions, have difficulty in getting along with parents, and are negatively viewed by their peers. They do poorly in school, and show difficulties in reading or learning basic subjects in schools in spite of the fact that there is no deficit in their intelligence.

Studies generally do not provide evidence for a biological basis of the disorder, whereas some relationship of the disorder with dietary factors, particularly food colouring, has been documented. On the other hand, social-psychological factors (e.g., home environment, family pathology) have been found to account for ADHD more reliably than other factors. Currently ADHD is considered to have multiple causes and effects.

Disagreement remains over the most effective method of treatment of ADHD. A drug, called Ritalin, is widely used, which decreases children's over-activity and distractibility, and at the same time increases their attention and ability to concentrate. However, it does not "cure" the problem, and often also results in such negative side-effects as the suppression in normal growth of height and weight. On the other hand, behavioural management programmes, featuring positive reinforcement and structuring learning materials and tasks in such a way that minimises errors and maximises immediate feedback and success, have been found quite useful. Successful modification of ADHD is claimed with cognitive behavioural training programme in which rewards for desired behaviours are combined with training in the use of verbal self-instructions (stop, think, and then do). With this procedure, the ADHD children learn to shift their attention less frequently and to behave reflectively — a learning that is relatively stable over time.

Perceptual Processes

In the previous section we have examined that the stimulation of sensory organs leads us to experience something such as, a flash of light or a sound, or a smell. This elementary experience, called sensation, does not provide us with any understanding of the stimulus that stimulated the sense organ. For example, it does not inform us about the source of the light, sound or fragrance. In order to make sense out of the raw material provided by the sensory system, we process it further. In doing so, we give meaning to stimuli by using our learning, memory, motivation, emotions, and other psychological processes. *The process by which we recognise, interpret or give meaning to the information provided by sense organs is called perception.* In interpreting stimuli or events, individuals often construct them in their own ways. Thus perception is not merely an interpretation of objects or events of the external or internal world as they exist, instead it is also a construction of those objects and events from one's own point of view.

The process of meaning-making involves certain sub-processes. These are shown in Fig.5.4.

Processing Approaches in Perception

How do we identify an object? Do we identify a dog because we have first recognised its furry coat, its four legs, its eyes, ears, and so on, or do we recognise these different parts because we have first identified a dog? The idea that recognition process begins from the parts, which serve as the basis for the recognition of the whole is known as **bottom-up processing**. The notion that recognition process begins from the whole, which leads to identification of its various components is known as **top-down processing**. The bottom-up approach lays emphasis on the features of stimuli in perception, and considers perception as a process of mental construction. The top-down approach lays emphasis on the perceiver, and considers perception as a process of recognition or identification of stimuli. Studies show that in perception both the processes interact with each other to provide us with an understanding of the world.

The Perceiver

Human beings are not just mechanical and passive recipients of stimuli from the external world. They are creative beings, and try to understand the external world in their own ways. In this process their motivations and expectations, cultural knowledge, past experiences, and memories as well as values, beliefs, and attitudes play an important role in giving meaning to the external world. Some of these factors are described here.

Motivation

The needs and desires of a perceiver strongly influence her/his perception. People want to fulfil their needs and desires through various means. One way to do this is to perceive objects in a picture as something that will satisfy their need. Experiments were conducted to examine the influence of hunger on perception. When hungry persons were

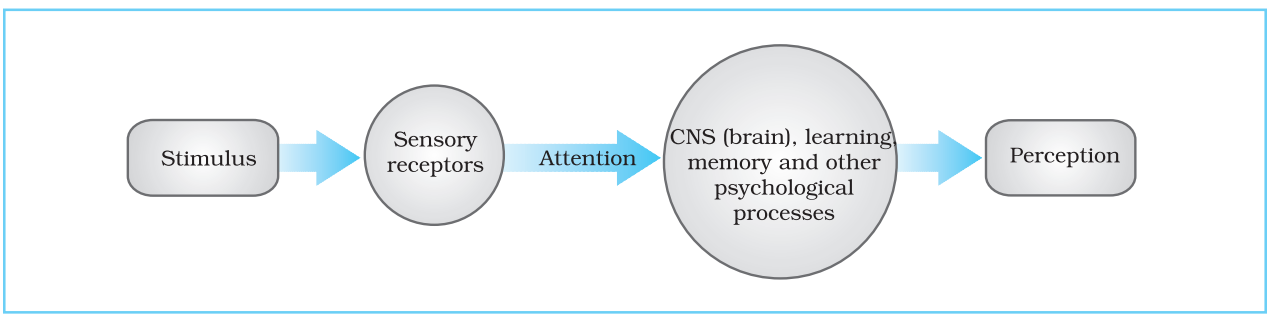

Fig.5.4 : Sub-processes of Perception

shown ambiguous pictures, they were found to perceive them as pictures of food objects more often than satiated (non-hungry) persons.

Expectations or Perceptual Sets

The expectations about what we might perceive in a given situation also influence our perception. This phenomenon of perceptual familiarisation or perceptual generalisation reflects a strong tendency to see what we expect to see even when the results do not accurately reflect external reality. For example, if your milkman delivers you milk daily at about 5.30 A.M., any knocking at the door around that time is likely to be perceived as the presence of the milkman even if it is someone else.

Activity 5.3

To demonstrate expectancy tell your friend to close her eyes. Write 12, 13, 14, 15 on the board. Ask her to open her eyes for 5 seconds, look at the board, and note down what she saw. Repeat replacing only the 12, 14, 15 with A, C, D viz. 'A 13 C D'. Ask her again to note down what she saw. Most people write down B in place of 13.

Cognitive Styles

Cognitive style refers to a consistent way of dealing with our environment. It significantly affects the way we perceive the environment. There are several cognitive styles that people use in perceiving their environment. One most extensively used in studies is the "field dependent and field independent" cognitive style. Field dependent people perceive the external world in its totality, i.e. in a global or holistic manner. On the other hand, field independent people perceive the external world by breaking it into smaller units, i.e. in an analytic or differentiated manner.

Look at Fig.5.5. Can you find out the triangle hidden in the picture? How much time do you take to locate it? Try to find out the time other students of your class take to locate the triangle. Those who can do it quickly will be called "field independent"; those who take long time will be called "field dependent".

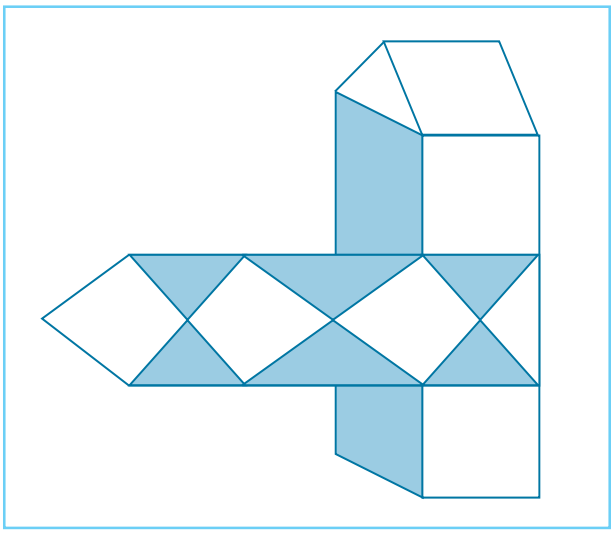

Fig.5.5 : An Item to test the 'Field Dependent' and 'Field Independent' Cognitive Style

Cultural Background and Experiences

Different experiences and learning opportunities available to people in different cultural settings also influence their perception. People coming from a pictureless environment fail to recognise objects in pictures. Hudson studied the perception of pictures by African subjects, and noted several difficulties. Many of them were unable to identify objects depicted in pictures (e.g., antelope, spear). They also failed to perceive distance in pictures, and interpreted pictures incorrectly. Eskimos have been found to make fine distinction among a variety of snow that we may be unable to notice. Some aboriginal groups of Siberian region have been found to differentiate among dozens of skin colours of reindeers, which we would not be able to do.

These studies indicate that the perceiver plays a key role in the process of perception. People process and interpret stimuli in their own ways depending on their personal, social and cultural conditions. Due to these factors our perceptions are not only finely tuned, but also modified.

Principles of Perceptual Organisation

Our visual field is a collection of different elements, such as points, lines, and colours. However, we perceive these elements as organised wholes or complete objects. For example, we see a bicycle as a complete object, not as a collection of different parts (e.g., saddle, wheel, handle). The process of organising visual field into meaningful wholes is known as **form perception**.

You may wonder how different parts of an objects are organised into a meaningful whole. You may also ask if there are certain factors that facilitate or inhibit this process of organisation.

Several scholars have tried to answer such questions, but the most widely accepted answer has been given by a group of researchers, called **Gestalt psychologists**. Prominent among them are Köhler, Koffka, and Wertheimer. Gestalt means a regular figure or a form. According to Gestalt psychologists, we perceive different stimuli not as discrete elements, but as an organised "whole" that carries a definite form. They believe that the form of an object lies in its whole, which is different from the sum of their parts. For example, a flower pot with a bunch of flowers is a whole. If the flowers are removed, the flower pot still remains a whole. It is the configuration of the flower pot that has changed. Flower pot with flowers is one configuration; without flowers it is another configuration.

The Gestalt psychologists also indicate that our cerebral processes are always oriented towards the perception of a **good figure** or **pragnanz**. That is the reason why we perceive everything in an organised form. The most primitive organisation takes place in the form of **figure-ground segregation**. When we look at a surface, certain aspects of the surface clearly stand out as separate entities, whereas others do not. For example, when we see words on a page, or a painting on a wall, or birds flying in the sky, the words, the painting, and the birds stand out from the background, and are perceived as figures, while the page, wall, and sky stay behind the figure and are perceived as background.

To test this experience, look at the Fig.5.6 given below. You will see either the white part of the figure, which looks like a vase (flower pot), or the black part of the figure, which looks like two faces.

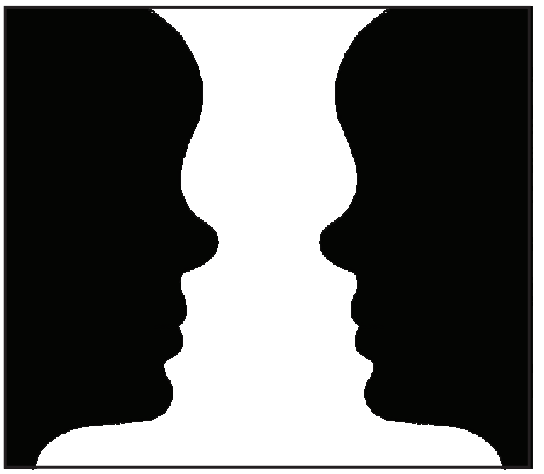

Fig.5.6 : Rubin's Vase

We distinguish figure from the ground on the basis of the following characteristics:

1. Figure has a definite form, while the background is relatively formless.
2. Figure is more organised as compared to its background.
3. Figure has a clear contour (outline), while the background is contourless.
4. Figure stands out from the background, while the background stays behind the figure.
5. Figure appears more clear, limited, and relatively nearer, while the background appears relatively unclear, unlimited, and away from us.

The discussion presented above indicates that human beings perceive the world in organised wholes rather than in discrete parts. The Gestalt psychologists have given us several laws to explain how and why different stimuli in our visual field are organised into meaningful whole objects. Let us look at some of these principles.

The Principle of Proximity

Objects that are close together in space or time are perceived as belonging together or as a group. For example, Fig.5.7 does not look like a square pattern of dots, but as a series of columns of dots. Similarly, Fig.5.7 also looks like a group of dots together in rows.

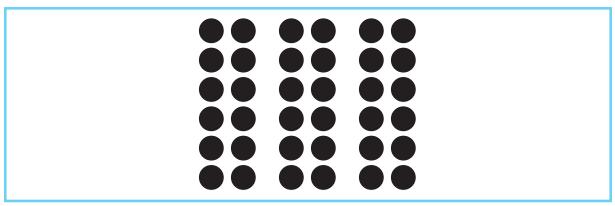

Fig.5.7 : Proximity

The Principle of Similarity

Objects that are similar to one another and have similar characteristics are perceived as a group. In Fig.5.8 the little circles and squares are evenly spaced both horizontally and vertically so that the proximity does not come into play. Instead, we tend to see alternating columns of circles and squares.

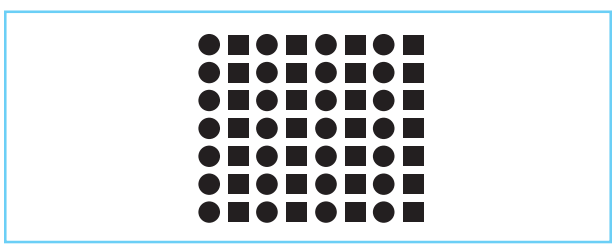

Fig.5.8 : Similarity

The Principle of Continuity

This principle states that we tend to perceive objects as belonging together if they appear to form a continuous pattern. For instance, we are more likely to identify two lines *a-b* and *c-d* crossing than to identify four lines meeting at the center *p*.

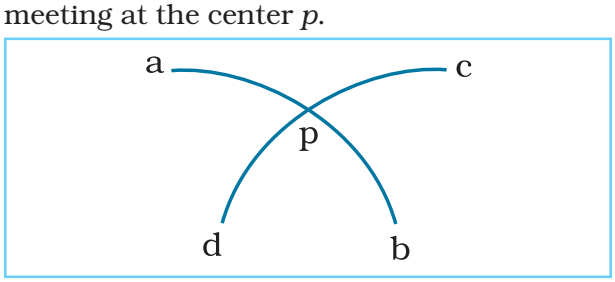

Fig.5.9 : Continuity

The Principle of Smallness

According to this principle, smaller areas tend to be seen as figures against a larger background. In Fig.5.10 we are more likely to see a black cross rather than a white cross within the circle because of this principle.

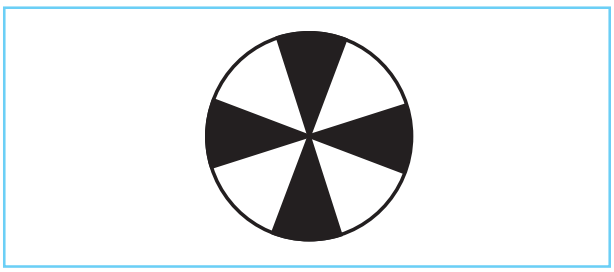

Fig.5.10 : Smallness

The Principle of Symmetry

This principle suggests that symmetrical areas tend to be seen as figures against asymmetrical backgrounds. For example, in Fig.5.11 the black areas are seen as figures (as they have symmetrical properties) against their white asymmetrical background.

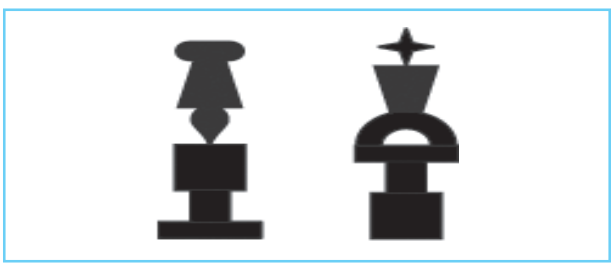

Fig.5.11 : Symmetry

The Principle of Surroundedness

According to this principle, the areas surrounded by others tend to be perceived as figures. For example, the image in Fig.5.12 looks like five figures against the white background rather than the word 'LIFT'.

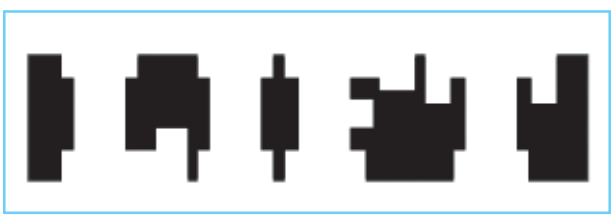

Fig.5.12 : Surroundedness

The Principle of Closure

We tend to fill the gaps in stimulation and perceive the objects as whole rather than their separate parts. For example, in Fig.5.13 the small angles are seen as a triangle due to our tendency to fill the gaps in the object provided by our sensory input.

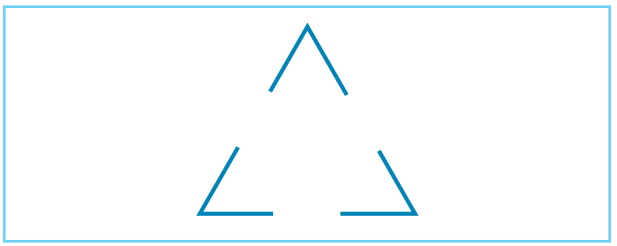

Fig.5.13 : Closure

Perception of Space, Depth, and Distance

The visual field or surface in which things exist, move or can be placed is called space. The space in which we live is organised in three dimensions. We perceive not only the spatial attributes (e.g., size, shape, direction) of various objects, but also the distance between the objects found in this space. While the images of objects projected on to our retina are flat and two dimensional (left, right, up, down), we still perceive three dimensions in the space. Why does it happen so? It occurs due to our ability to transfer a two dimensional retinal vision into a three dimensional perception. The process of viewing the world in three dimensions is called distance or depth perception.

Depth perception is important in our daily life. For example, when we drive, we use depth to assess the distance of an approaching automobile, or when we decide to call a person walking down the street, we determine the loudness with which to call.

In perceiving depth, we depend on two main sources of information, called cues. One is called binocular cues because they require both eyes. Another is called monocular cues, because they allow us to perceive depth with just one eye. A number of such cues are used to change a two dimensional image into a three dimensional perception.

Monocular Cues (Psychological Cues)

Monocular cues of depth perception are effective when the objects are viewed with only one eye. These cues are often used by artists to induce depth in two dimensional paintings. Hence, they are also known as pictorial cues. Some important monocular cues that help us in judging the distance and depth in two dimensional surfaces are described below. You will find some of them applied in Fig.5.14.

Fig.5.14 : Monocular Cues

The above picture will help you to understand some monocular cues: Interposition and relative size (see the trees). Which other cues can you locate in the picture?

Relative Size : The size of retinal image allows us to judge distance based on our past and present experience with similar objects. As the objects get away, the retinal image becomes smaller and smaller. We tend to perceive an object farther away when it appears small, and closer when it appears bigger.

Interposition or Overlapping : These cues occur when some portion of the object is covered by another object. The overlapped object is considered farther away, whereas the object that covers it appears nearer.

Linear Perspective : This reflects a phenomenon by which distant objects appear to be closer together than the nearer objects. For example, parallel lines, such as rail tracks,

appear to converge with increasing distance with a vanishing point at the horizon. The more the lines converge, the farther away they appear.

Aerial Perspective : The air contains microscopic particles of dust and moisture that make distant objects look hazy or blurry. This effect is called aerial perspective. For example, distant mountains appear blue due to the scattering of blue light in the atmosphere, whereas the same mountains are perceived to be closer when the atmosphere is clear.

Light and Shade : In the light some parts of the object get highlighted, whereas some parts become darker. Highlights and shadows provide us with information about an object's distance.

Relative Height : Larger objects are perceived as being closer to the viewer and smaller objects as being farther away. When we expect two objects to be the same size and they are not, the larger of the two will appear closer and the smaller will appear farther away.

Texture Gradient : It represents a phenomenon by which the visual field having more density of elements is seen farther away. In the Fig.5.15 the density of stones increases as we look farther away.

Fig.5.15 : Texture Gradient

Motion Parallax : It is a kinetic monocular cue, and hence not considered as a pictorial cue. It occurs when objects at different distances move at a different relative speed. The distant objects appear to move slowly than the objects that are close. The rate of an object's movement provides a cue to its distance. For example, when we travel in a bus, closer objects move "against" the direction of the bus, whereas the farther objects move "with" the direction of the bus.

Binocular Cues (Physiological Cues)

Some important cues to depth perception in three dimensional space are provided by both the eyes. Three of them have particularly been found to be interesting.

Retinal or Binocular Disparity : Retinal disparity occurs because the two eyes have different locations in our head. They are separated from each other horizontally by a distance of about 6.5 centimeters. Because of this distance, the image formed on the retina of each eye of the same object is slightly different. This difference between the two images is called retinal disparity. The brain interprets a large retinal disparity to mean a close object and a small retinal disparity to mean a distant object, as the disparity is less for distant objects and more for the near objects.

Convergence : When we see a nearby object our eyes converge inward in order to bring the image on the fovea of each eye. A group of muscles send messages to the brain regarding the degree to which eyes are turning inward, and these messages are interpreted as cues to the perception of depth. The degree of convergence decreases as the object moves further away from the observer. You can experience convergence by holding a finger in front of your nose and slowly bringing it closer. The more your eyes turn inward or converge, the nearer the object appears in space.

Accommodation : Accommodation refers to a process by which we focus the image on the retina with the help of ciliary muscle. These muscles change the thickness of the lens of the eye. If the object gets away (more than 2 meters), the muscle is relaxed. As the object moves nearer, the muscle contracts and the thickness of the lens increases. The signal

about the degree of contraction of the muscle is sent to the brain, which provides the cue for distance.

Activity 5.4

Hold a pencil in front of you. Close your right eye and focus on the pencil. Now open the right eye and close the left eye. Keep doing it simultaneously with both the eyes. The pencil will appear to move from side to side in front of your face.

Perceptual Constancies

The sensory information that we receive from our environment constantly changes as we move around. Yet we form a stable perception of an object seen from any position and in any intensity of light. Perception of the objects as relatively stable in spite of changes in the stimulation of sensory receptors is called perceptual constancy. Here we will examine three types of perceptual constancies that we commonly experience in our visual domain.

Size Constancy

The size of an image on our retina changes with the change in the distance of the object from the eye. The further away it is, the smaller is the image. On the other hand, our experience shows that within limits the object appears to be about the same size irrespective of its distance. For example, when you approach your friend from a distance, your perception of the friend's size does not change much despite the fact that the retinal image (image on retina) becomes larger. This tendency for the perceived size of objects to remain relatively unchanged with changes in their distance from the observer and the size of the retinal image is called size constancy.

Shape Constancy

In our perceptions the shapes of familiar objects remain unchanged despite changes in the pattern of retinal image resulting from differences in their orientation. For example, a dinner plate looks the same shape whether the image that it casts on the retina is a circle, or an ellipse, or roughly a short line (if the plate is viewed from the edge). It is also called form constancy.

Brightness Constancy

Visual objects not only appear constant in their shape and size, they also appear constant in their degree of whiteness, greyness, or blackness even though the amount of physical energy reflected from them changes considerably. In other words, our experience of brightness does not change in spite of the changes in the amount of reflected light reaching our eyes. The tendency to maintain apparent brightness constant under different amount of illumination is called brightness constancy. For example, surface of a paper which appears white in the sunlight, is still perceived as white in the room light. Similarly, coal that looks black in the sun also looks black in room light.

Illusions

Our perceptions are not always veridical. Sometime we fail to interpret the sensory information correctly. This results in a mismatch between the physical stimuli and its perception. These misperceptions resulting from misinterpretation of information received by our sensory organs are generally known as illusions. These are experienced more or less by all of us. They result from an external stimulus situation and generate the same kind of experience in each individual. That is why illusions are also called "primitive organisations". Although illusions can be experienced by the stimulation of any of our senses, psychologists have studied them more commonly in the visual than in other sense modalities.

Some perceptual illusions are universal and found in all individuals. For example, the rail tracks appear to be converging to all of us. These illusions are called universal illusions or permanent illusions as they do not change with experience or practice. Some other illusions seem to vary from individual

to individual; these are called personal illusions. In this section, we will describe some important visual illusions.

Geometrical Illusions

In Fig.5.16 the Muller-Lyer illusion has been shown. All of us perceive line A as shorter than line B, although both the lines are equal. This illusion is experienced even by children. There are some studies that suggest that even

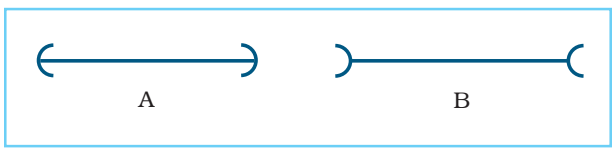

Fig.5.16 : Muller-Lyer Illusion

animals experience this illusion more or less like us. Besides Muller-Lyer illusion, several other visual illusions are experienced by human beings (also birds and animals). In Fig.5.17 you can see the illusion of vertical and horizontal lines. Although both the lines are equal, we perceive the vertical line as longer than the horizontal line.

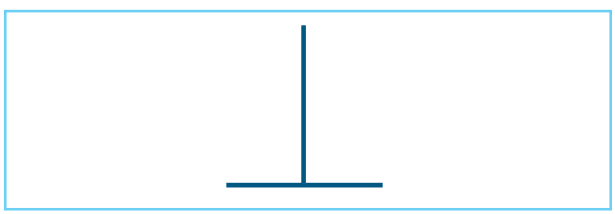

Fig.5.17 : Vertical-Horizontal Illusion

Apparent Movement Illusion

This illusion is experienced when some motionless pictures are projected one after another at an appropriate rate. This illusion is referred to as "**phi-phenomenon**". When we see moving pictures in a cinema show, we are influenced by this kind of illusion. The succession of flickering electrical lights also generate this illusion. This phenomenon can be experimentally studied with the help of an instrument by presenting two or more lights in a succession. For the experience of this illusion, Wertheimer had reported the presence of appropriate level of brightness, size, spatial gap, and temporal contiguity of different lights to be important. In the absence of these, the light points will not appear as moving. They will appear either as one point, or as different points appearing one after another, without any experience of motion.

Experience of illusions indicates that people do not always perceive the world as it is; instead they engage in its construction, sometimes based on the features of stimuli and sometimes based on their experiences in a given environment. This point will be further made clear in the section that follows now.

Socio-Cultural Influences on Perception

Several psychologists have studied the processes of perception in different socio-cultural settings. The questions they try to answer through these studies are: Does perceptual organisation of people living in different cultural settings take place in an uniform manner? Are the perceptual processes universal, or they vary across different cultural settings? Because we know, people living in different parts of the world look different, many psychologists hold the view that their ways of perceiving the world must be different in some respects. Let us examine some studies relating to perception of illusion figures and other pictorial materials.

You are already familiar with Muller-Lyer and Vertical-Horizontal illusion figures. Psychologists have used these figures with several groups of people living in Europe, Africa, and many other places. Segall, Campbell, and Herskovits carried out the most extensive study of illusion susceptibility by comparing samples from remote African villages and Western urban settings. It was found that African subjects showed greater susceptibility to horizontal-vertical illusion, whereas Western subjects showed greater susceptibility to Muller-Lyer illusion. Similar findings have been reported in other studies also. Living in dense forests the African subjects regularly experienced verticality (e.g., long trees) and developed a tendency to overestimate it. The Westerners, who lived in

an environment characterised by right angles, developed a tendency to underestimate the length of lines characterised by enclosure (e.g., arrowhead). This conclusion has been confirmed in several studies. It suggests that the habits of perception are learnt differently in different cultural settings.

In some studies people living in different cultural settings have been given pictures for identification of objects and interpretation of depth or other events represented in them. Hudson did a seminal study in Africa, and found that people, who had never seen pictures, had great difficulty in recognising objects depicted in them and in interpreting depth cues (e.g., superimposition). It was indicated that informal instruction in home and habitual exposure to pictures were necessary to sustain the skill of pictorial depth perception. Sinha and Mishra have carried out several studies on pictorial perception using a variety of pictures with people from diverse cultural settings, such as hunters and gatherers living in forests, agriculturists living in villages, and people employed and living in cities. Their studies indicate that interpretation of pictures is strongly related to cultural experiences of people. While people in general can recognise familiar objects in pictures, those less exposed to pictures have difficulty in the interpretation of actions or events depicted in them.

Key Terms

Absolute threshold, After images, Binocular cues, Bottom-up processing, Cochlea, Cones, Dark adaptation, Depth perception, Difference threshold, Divided attention, Eustachian tube, Figure-ground segregation, Filter theory, Filter-attenuation theory, Gestalt, Light adaptation, Loudness, Monocular cues, Organ of corti, Perceptual constancies, Phi-phenomenon, Pitch, Primary colours, Retina, Rhodopsin, Rods, Selective attention, Sustained attention, Timbre, Top-down processing, Visual illusions, Wavelength

Summary

- *Knowledge of our internal and external world becomes possible with the help of senses. Five of them are external senses, and two are internal senses. The sense organs receive various stimuli and send them in the form of neural impulses to specialised areas of brain for interpretation.*
- *Vision and audition are the two most widely used senses. Rods and cones are the receptors for vision. Rods function in low intensities of light, whereas cones function at high intensities of light. They are responsible for achromatic and chromatic vision, respectively.*
- *Light and dark adaptations are two interesting phenomena of the visual system. Hue, saturation and brightness are the basic dimensions of colour.*
- *Sound serves as stimulus for auditory sensations. Loudness, pitch, and timbre are the properties of sound. Organ of corti located in the basilar membrane is the chief organ of hearing.*
- *Attention is a process through which we select certain information by filtering out many others that appear to be irrelevant at a given moment of time. Activation, concentration, and search are important properties of attention.*
- *Selective and sustained attention are two major types of attention. Divided attention is evident in the case of highly practiced tasks in which there is much automaticity of information processing.*
- *The span of attention is the magical number of seven plus and minus two.*
- *Perception refers to the processes of interpretation and informed construction of the information received from sensory organs. Human beings perceive their world in terms of their motivations, expectations, cognitive styles, and cultural background.*
- *Form perception refers to the perception of a visual field set off from rest of the field by visible contours. The most primitive form of organisation takes place in the form of figure-ground segregation.*

- *Gestalt psychologists have identified several principles that determine our perceptual organisations.*
- *The image of an object projected on to the retina is two dimensional. Three dimensional perception is a psychological process that depends on correct utilisation of certain monocular and binocular cues.*
- *Perceptual constancies refer to invariance of our perceptions of an object seen from any position and in any intensity of light. There is good evidence for size, shape, and brightness constancies.*
- *Illusions are the examples of nonveridical perceptions. They refer to misperceptions resulting from misinterpretation of information received by our sensory organs. Some illusions are universal, while others are more personal and culture-specific.*
- *Socio-cultural factors play an important role in our perceptions by generating differential familiarity with and salience of stimuli as well as certain habits of perceptual inference among people.*

Review Questions

1. Explain the functional limitations of sense organs.
2. What is meant by light and dark adaptation? How do they take place?
3. What is colour vision and what are the dimensions of colour?
4. How does auditory sensation take place?
5. Define attention. Explain its properties.
6. State the determinants of selective attention. How does selective attention differ from sustained attention?
7. What is the main proposition of Gestalt psychologists with respect to perception of the visual field?
8. How does perception of space take place?
9. What are the monocular cues of depth perception? Explain the role of binocular cues in the perception of depth?
10. Why do illusions occur?
11. How do socio-cultural factors influence our perceptions?

Project Ideas

1. Collect ten advertisements from magazines. Analyse the content and message being conveyed in each advertisement. Comment on the use of various attentional and perceptual factors to promote the given product.
2. Give a toy model of a horse/elephant to visually challenged and sighted children. Let the visually challenged children feel by touching the toy model for some time. Ask the children to describe the model. Show the same toy model to sighted children. Compare their descriptions and find out their similarities and differences.

   Take another toy model (e.g., a parrot) and give it to a few visually challenged children to have a feel of it by touching. Then give a sheet of paper and a pencil and ask them to draw the parrot on the sheet. Show the same parrot to sighted children for some time, remove the parrot from their sight, and ask to draw the parrot on a sheet of paper.

   Compare the drawings of the visually challenged and sighted children and examine their similarities and differences.

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Chapter 6

Learning

After reading this chapter, you would be able to

- describe the nature of learning,
- explain different forms or types of learning and the procedures used in such types of learning,
- understand various psychological processes that occur during learning and influence its course,
- explain the determinants of learning, and
- familiarise yourself with some applications of learning principles.

Contents

Introduction
Nature of Learning
Paradigms of Learning
Classical Conditioning
Determinants of Classical Conditioning
Operant/Instrumental Conditioning
Determinants of Operant Conditioning
Classical and Operant Conditioning : Differences (Box 6.1)
Key Learning Processes
Learned Helplessness (Box 6.2)
Observational Learning
Cognitive Learning
Verbal Learning
Concept Learning
Skill Learning
Transfer of Learning
Factors Facilitating Learning
The Learner : Learning Styles
Learning Disabilities
Applications of Learning Principles

Key Terms
Summary
Review Questions
Project Ideas

Learning preserves errors of the past as well as its wisdom.

– A.N. Whitehead

Introduction

At the time of birth every human baby is equipped with the capacity to make a limited number of responses. These responses occur reflexively whenever appropriate stimuli are present in the environment. As the child grows and matures, s/he becomes capable of making diverse types of responses. These include identifying the images of some persons as one's mother, father or grandfather, using a spoon when eating food, and learning how to identify alphabets, to write, and to combine them into words. S/he also observes others doing things in specific environmental conditions, and imitates them. Learning names of objects such as book, orange, mango, cow, boy, and girl, and retaining them is another important task. As one grows older, one observes many events or objects, and learns their distinct features. Objects are categorised as 'furniture', 'fruits', and so on. One also learns to drive a scooter or a car, to communicate with others effectively, and to interact with others. It is all due to learning that a person becomes hard working or indolent, socially knowledgeable, skilled, and professionally competent. Each individual manages her or his life and solves all kinds of problems because of the capacity to learn and adapt. This chapter focuses on the various aspects of learning. First, learning is defined and characterised as a psychological process. Second, an account is presented that explains how one learns. A number of learning methods that account for simple to complex types of learning are described. In the third section, some empirical phenomena, that occur in the course of learning, are explained. In the fourth section, different factors that determine the speed and extent of learning are described including different learning styles and learning disabilities.

Nature of Learning

As indicated above learning is a key process in human behaviour. It refers to a spectrum of changes that take place as a result of one's experience. Learning may be defined as "*any relatively permanent change in behaviour or behavioural potential produced by experience*". One must remember that some behavioural changes occur due to the use of drugs, or fatigue. Such changes are temporary. They are not considered learning. *Changes due to practice and experience, which are relatively permanent, are illustrative of learning.*

Features of Learning

The process of learning has certain distinctive characteristics. *The first feature is that learning always involves some kinds of experience.* We experience an event occurring in a certain sequence on a number of occasions. If an event happens then it may be followed by certain other events. For example, one learns that if the bell rings in the hostel after sunset, then dinner is ready to be served. Repeated experience of satisfaction after doing something in a specified manner leads to the formation of habit. Sometimes a single experience can lead to learning. A child strikes a matchstick on the side of a matchbox, and gets her/his fingers burnt. Such an experience makes the child learn to be careful in handling the matchbox in future.

Behavioural changes that occur due to learning are relatively permanent. They must be distinguished from the behavioural changes that are neither permanent nor learned. For

example, changes in behaviour often occur due to the effects of fatigue, habituation, and drugs. Suppose you are reading your textbook of psychology for sometime or you are trying to learn how to drive a motor car, a time comes when you will feel tired. You stop reading or driving. This is a behavioural change due to fatigue, and is temporary. It is not considered learning.

Let us take another case of change in one's behaviour. Suppose in the vicinity of your residence a marriage is being performed. It generates a lot of noise, which continues till late night. In the beginning, the noise distracts you from whatever you are doing. You feel disturbed. While the noise continues, you make some *orienting reflexes*. These reflexes become weaker and weaker, and eventually become undetectable. This is also one kind of behavioural change. This change is due to continuous exposure to stimuli. It is called *habituation*. It is not due to learning. You must have noticed that people who are on sedatives or drugs or alcohol, their behaviour changes as it affects physiological functions. Such changes are temporary in nature and disappear, as the effect wears out.

Learning involves a sequence of psychological events. This will become clear if we were to describe a typical learning experiment. Suppose psychologists are interested in understanding how a list of words is learned. They will go through the following sequence : (i) do a pre-test to know how much the person knows before learning, (ii) present the list of words to be remembered for a fixed time, (iii) during this time the list of words is processed towards acquiring new knowledge, (iv) after processing is complete, new knowledge is acquired (this is LEARNING), and (v) after some time elapses, the processed information is recalled by the person. By comparing the number of words which a person now knows as compared to what s/he knew in the pre-test, one infers that learning did take place.

Thus, *learning is an inferred process* and is different from **performance**. Performance is a person's observed behaviour or response or action. Let us understand what is meant by the term inference. Suppose you are asked by your teacher to memorise a poem. You read that poem a number of times. Then you say that you have learned the poem. You are asked to recite the poem and you are able to recite it. The recitation of the poem by you is your performance. On the basis of your performance, the teacher infers that you have learned the poem.

Paradigms of Learning

Learning takes place in many ways. There are some methods that are used in acquisition of simple responses while other methods are used in the acquisition of complex responses. In this section you will learn about all these methods. The simplest kind of learning is called **conditioning**. Two types of conditioning have been identified. The first one is called **classical conditioning**, and the second **instrumental/operant conditioning**. In addition, we have **observational learning**, **cognitive learning**, **verbal learning**, **concept learning**, and **skill learning**.

Classical Conditioning

This type of learning was first investigated by Ivan P. Pavlov. He was primarily interested in the physiology of digestion. During his studies he noticed that dogs, on whom he was doing his experiments, started secreting saliva as soon as they saw the empty plate in which food was served. As you must be aware, saliva secretion is a reflexive response to food or something in the mouth. Pavlov designed an experiment to understand this process in detail in which dogs were used once again. In the first phase, a dog was placed in a box and harnessed. The dog was left in the box for some time. This was repeated a number of times on different days. In the meantime, a simple surgery was conducted, and one end of a tube was inserted in the dog's jaw and the other end of the tube was put in a measuring glass. The experimental setup is illustrated in Figure 6.1.

In the second phase of the experiment, the dog was kept hungry and placed in harness with one end of the tube ending in the jaw and the other end in the glass jar. A bell was

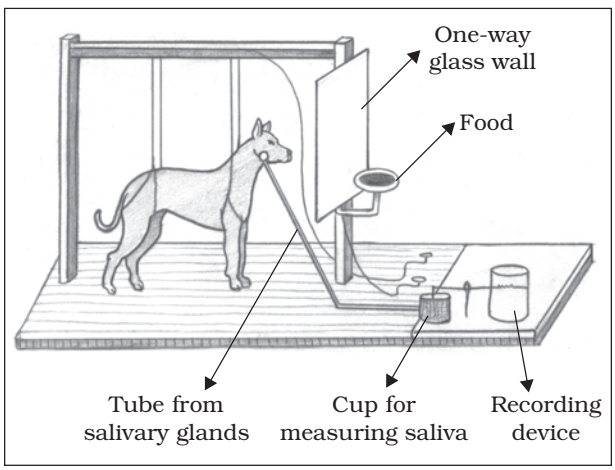

Fig.6.1 : A Dog in Pavlovian Harness for Conditioning

sounded and immediately thereafter food (meat powder) was served to the dog. The dog was allowed to eat it. For the next few days, everytime the meat powder was presented, it was preceded by the sound of a bell. After a number of such trials, a test trial was introduced in which everything was the same as the previous trials except that no food followed the sounding of the bell. The dog still salivated to the sound of the bell, expecting presentation of the meat powder as the sound of bell had come to be connected with it. This association between the bell and food resulted in acquisition of a new response by the dog, i.e. salivation to the sound of the bell. This has been termed as conditioning. You may have noticed that all dogs salivate when they are presented with food. Food is thus an **Unconditioned Stimulus (US)** and salivation which follows it, an **Unconditioned Response (UR)**. After conditioning, salivation started to occur in the presence of the sound of the bell. The bell becomes a **Conditioned Stimulus (CS)** and saliva secretion a **Conditioned Response (CR)**. This kind of conditioning is called **classical conditioning**. The procedure is illustrated in Table 6.1. It is obvious that the learning situation in classical conditioning is one of **S–S learning** in which one stimulus (e.g., sound of bell) becomes a signal for another stimulus (e.g., food). Here *one stimulus signifies the possible occurrence of another stimulus.*

Examples of classical conditioning abound in everyday life. Imagine you have just finished your lunch and you are feeling satisfied. Then you see some sweet dish served on the adjoining table. This signals its taste in your mouth, and triggers the secretion of saliva. You feel like eating it. This is a conditioned response (CR). Let us take another example. In the early stages of childhood, one is naturally afraid of any loud noise. Suppose a small child catches an inflated balloon which bursts in her/his hands making a loud noise. The child becomes afraid. Now the next time s/he is made to hold a balloon, it becomes a signal or cue for noise and elicits fear response. This happens because of contiguous presentation of balloon as a conditioned stimulus (CS) and loud noise as an unconditioned stimulus (US).

Determinants of Classical Conditioning

How quickly and strongly acquisition of a response occurs in classical conditioning depends on several factors. Some of the major

Table 6.1 Relationship of Stages of Conditioning and Operations

Stages of Conditioning	*Nature of Stimulus*	*Nature of Response*
Before	Food (US) Sound of the Bell	Salivation (UR) Alertness (No Specific Response)
During	Sound of the Bell (CS) + Food (US)	Salivation (UR)
After	Sound of the Bell (CS)	Salivation (CR)

factors influencing learning a CR are described below:

1. *Time Relations between Stimuli* : The classical conditioning procedures, discussed below, are basically of four types based on the time relations between the onset of conditioned stimulus (CS) and unconditioned stimulus (US). The first three are called **forward conditioning** procedures, and the fourth one is called **backward conditioning** procedure. The basic experimental arrangements of these procedures are as follows:

a) When the CS and US are presented together, it is called **simultaneous conditioning**.

b) In **delayed conditioning**, the onset of CS precedes the onset of US. The CS ends before the end of the US.

c) In **trace conditioning**, the onset and end of the CS precedes the onset of US with some time gap between the two.

d) In **backward conditioning**, the US precedes the onset of CS.

It is now well established that delayed conditioning procedure is the most effective way of acquiring a CR. Simultaneous and trace conditioning procedures do lead to acquisition of a CR, but they require greater number of acquisition trials in comparison to the delayed conditioning procedure. It may be noted that the acquisition of response under backward conditioning procedure is very rare.

2. *Type of Unconditioned Stimuli* : The unconditioned stimuli used in studies of classical conditioning are basically of two types, i.e. **appetitive** and **aversive**. Appetitive unconditioned stimuli automatically elicits approach responses, such as eating, drinking, caressing, etc. These responses give satisfaction and pleasure. On the other hand, aversive US, such as noise, bitter taste, electric shock, painful injections, etc. are painful, harmful, and elicit avoidance and escape responses. It has been found that appetitive classical conditioning is slower and requires greater number of acquisition trials, but aversive classical conditioning is established in one, two or three trials depending on the intensity of the aversive US.

3. *Intensity of Conditioned Stimuli* : This influences the course of both appetitive and aversive classical conditioning. More intense conditioned stimuli are more effective in accelerating the acquisition of conditioned responses. It means that the more intense the conditioned stimulus, the fewer are the number of acquisition trials needed for conditioning.

Activity 6.1

In order to understand and explain conditioning, you may carry out the following exercise. Take a few pieces of mango pickle on a plate and show it to the students in the classroom. Ask them what they experienced in their mouth?

Most of your classmates are likely to report some salivation in their mouth.

Operant/Instrumental Conditioning

This type of conditioning was first investigated by B.F. Skinner. Skinner studied occurrence of voluntary responses when an organism operates on the environment. He called them **operants**. *Operants are those behaviours or responses, which are emitted by animals and human beings voluntarily and are under their control.* The term operant is used because the organism operates on the environment. Conditioning of operant behaviour is called **operant conditioning**.

Skinner conducted his studies on rats and pigeons in specially made boxes, called the **Skinner Box**. A hungry rat (one at a time) is placed in the chamber, which was so built that the rat could move inside but could not come out. In the chamber there was a lever, which was connected to a food container kept on the top of the chamber (see Figure 6.2). When the lever is pressed, a food pellet drops on the plate placed close to the lever. While moving around and pawing the walls (exploratory behaviour), the hungry rat accidentally presses the lever and a food pellet drops on the plate. The hungry rat eats it. In the next trial, after a while the exploratory behaviour again starts. As the number of trials increases, the rat takes

lesser and lesser time to press the lever for food. Conditioning is complete when the rat presses the lever immediately after it is placed in the chamber. It is obvious that *lever pressing is an operant response and getting food is its consequence.*

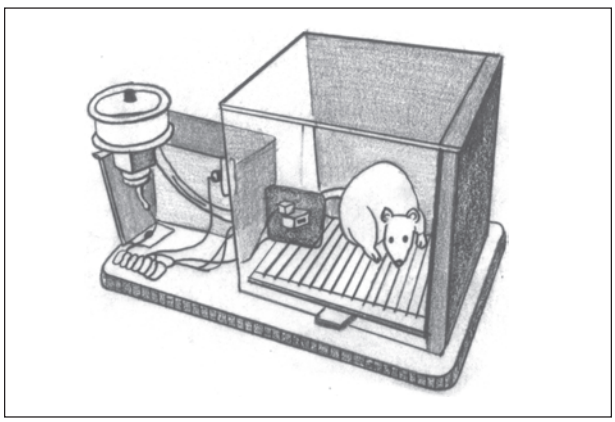

Fig.6.2 : Skinner Box

In the above situation the response is instrumental in getting the food. That is why, this type of learning is also called **instrumental conditioning**. Examples of instrumental conditioning abound in our everyday life. Children who want to have some sweets in the absence of their mother learn to locate the jar in which mother hides the sweets for safekeeping and eat it. Children learn to be polite and say 'please' to get favours from their parents and others. One learns to operate mechanical gadgets such as radio, camera, T.V., etc. based on the principle of instrumental conditioning. As a matter of fact human beings learn short cuts to attain desired goals or ends through instrumental conditioning.

Determinants of Operant Conditioning

You have noted that *operant or instrumental conditioning is a form of learning in which behaviour is learned, maintained or changed through its consequences.* Such consequences are called **reinforcers**. *A reinforcer is defined as any stimulus or event, which increases the probability of the occurrence of a (desired) response.* A reinforcer has numerous features, which affect the course and strength of a response. They include its *types* – positive or negative, *number or frequency, quality* – superior or inferior, and *schedule* – continuous or intermittent (partial). All these features influence the course of operant conditioning. Another factor that influences this type of learning is the *nature of the response or behaviour* that is to be conditioned. The *interval or length of time* that lapses between occurrence of response and reinforcement also influences operant learning. Let us examine some of these factors in detail.

Types of Reinforcement

Reinforcement may be positive or negative. Positive reinforcement involves stimuli that have pleasant consequences. They strengthen and maintain the responses that have caused them to occur. Positive reinforcers satisfy needs, which include food, water, medals, praise, money, status, information, etc. Negative reinforcers involve unpleasant and painful stimuli. *Responses that lead organisms to get rid of painful stimuli or avoid and escape from them provide negative reinforcement.* Thus, negative reinforcement leads to learning of avoidance and escape responses. For instance, one learns to put on woollen clothes, burn firewood or use electric heaters to avoid the unpleasant cold weather. One learns to move away from dangerous stimuli because they provide negative reinforcement. It may be noted that negative reinforcement is not punishment. Use of punishment reduces or suppresses the response while a negative reinforcer increases the probability of avoidance or escape response. For instance, drivers and co-drivers wear their seat belts to avoid getting injured in case of an accident or to avoid being fined by the traffic police.

It should be understood that no punishment suppresses a response permanently. Mild and delayed punishment has no effect. The stronger the punishment, the more lasting is the suppression effect but it is not permanent.

Sometimes punishment has no effect irrespective of its intensity. On the contrary, the punished person may develop dislike and

hatred for the punishing agent or the person who administers the punishment.

Number of Reinforcement and other Features

It refers to the number of trials on which an organism has been reinforced or rewarded. Amount of reinforcement means how much of reinforcing stimulus (food or water or intensity of pain causing agent) one receives on each trial. Quality of reinforcement refers to the kind of reinforcer. Chickpeas or pieces of bread are of inferior quality as compared with raisins or pieces of cake as reinforcer. The course of operant conditioning is usually accelerated to an extent as the number, amount, and quality of reinforcement increases.

Schedules of Reinforcement

A reinforcement schedule is the arrangement of the delivery of reinforcement during conditioning trials. Each schedule of reinforcement influences the course of conditioning in its own way; and thus conditioned responses occur with differential characteristics. The organism being subjected to operant conditioning may be given reinforcement in every acquisition trial or in some trials it is given and in others it is omitted. Thus, the reinforcement may be *continuous* or *intermittent*. When a desired response is reinforced every time it occurs we call it **continuous reinforcement**. In contrast, in intermittent schedules responses are sometimes reinforced, sometimes not. It is known as **partial reinforcement** and has been found to produce greater **resistance to extinction** – than is found with continuous reinforcement.

Delayed Reinforcement

The effectiveness of reinforcement is dramatically altered by delay in the occurrence of reinforcement. It is found that *delay in the delivery of reinforcement leads to poorer level of performance*. It can be easily shown by asking children which reward they will prefer for doing some chore. Smaller rewards immediately after doing the chore will be preferred rather than a big one after a long gap.

Key Learning Processes

When learning takes place, be it classical or operant conditioning, it involves the occurrence of certain processes. These include

Box 6.1 Classical and Operant Conditioning : Differences

1. *In classical conditioning, the responses are under the control of some stimulus because they are reflexes, automatically elicited by the appropriate stimuli. Such stimuli are selected as US and responses elicited by them as UR. Thus Pavlovian conditioning, in which US elicits responses, is often called respondent conditioning.*

   In instrumental conditioning, responses are under the control of the organism and are voluntary responses or 'operants'. Thus, in the two forms of conditioning different types of responses are conditioned.
2. *In classical conditioning the CS and US are well-defined, but in operant conditioning CS is not defined. It can be inferred but is not directly known.*
3. *In classical conditioning, the experimenter controls the occurrence of US, while in operant conditioning the occurrence of the reinforcer is under the control of the organism that is learning. Thus, for US in classical conditioning the organism remains passive, while in operant conditioning the subject has to be active in order to be reinforced.*
4. *In the two forms of conditioning, the technical terms used to characterise the experimental proceedings are different. Moreover what is called reinforcer in operant conditioning is called US in classical conditioning. An US has two functions. In the beginning it elicits the response and also reinforces the response to be associated and elicited later on by the CS.*

Box 6.2 Learned Helplessness

It is an interesting phenomenon, which is a result of an interaction between the two forms of conditioning. Learned helplessness underlies psychological cases of depression. Seligman and Maier demonstrated this phenomenon in a study on dogs. First, they subjected dogs to sound (CS) and electric shock (US) using classical conditioning procedure. The animal had no scope to escape or avoid the shock. This pairing was repeated a number of times. Then the dogs were subjected to shock in an operant conditioning procedure. The dogs could escape the shock by pressing their heads against the wall. After having experienced inescapable shock in the Pavlovian contingency, the dog failed to escape or avoid shock in the operant conditioning procedure. The dog just suffered the shock through, and did not attempt to escape. This behaviour of the dog was called learned helplessness.

This phenomenon has been shown to be operative in humans also. It has been found that continuous failure in a set of tasks shows the occurrence of learned helplessness. In an experimental study, the subjects are initially given failure experience irrespective of their performance. In the second phase the subjects are given a task. Learned helplessness is often measured in terms of the subject's ability and persistence before they give up the task. Continuous failure leads to little persistence and poor performance. This shows helplessness. There are numerous studies that demonstrate that persistent depression is often caused by learned helplessness.

reinforcement, **extinction** or non-occurrence of learned response, **generalisation** of learning to other stimuli under some specifiable conditions, **discrimination** between reinforcing and non-reinforcing stimuli, and **spontaneous recovery**.

Reinforcement

Reinforcement is the operation of administering a reinforcer by the experimenter. Reinforcers are stimuli that increase the rate or probability of the responses that precede. We have noted that reinforced responses increase in rate, while non-reinforced responses decrease in rate. A positive reinforcer increases the rate of response that precedes its presentation. Negative reinforcers increase the rate of the response that precedes their removal or termination. The reinforcers may be primary or secondary. A **primary reinforcer** is biologically important since it determines the organism's survival (e.g., food for a hungry organism). A secondary reinforcer is one which has acquired characteristics of the reinforcer because of the organism's experience with the environment. We frequently use money, praise, and grades as reinforcers. They are called **secondary reinforcers**. Systematic use of reinforcers can lead to the desired response. Such a response is shaped by reinforcing successive approximations to the desired response.

Extinction

Extinction means disappearance of a learned response due to removal of reinforcement from the situation in which the response used to occur. If the occurrence of CS-CR is not followed by the US in classical conditioning, or lever pressing is no more followed by food pellets in the Skinner box, the learned behaviour will gradually be weakened and ultimately disappear.

Learning shows **resistance to extinction**. It means that even though the learned response is now not reinforced, it would continue to occur for sometime. However, with increasing number of trials without reinforcement, the response strength gradually diminishes and ultimately it stops occurring. How long a learned response shows resistance to extinction depends on a number of factors. It has been found that with increasing number of reinforced trials resistance to extinction increases and learned response reaches its highest level. At this level performance gets stabilised. After that the number of trials do not make a difference in

the response strength. Resistance to extinction increases with increasing number of reinforcements during acquisition trials, beyond that any increase in number of reinforcement reduces the resistance to extinction. Studies have also indicated that as the amount of reinforcement (number of food pellets) increases during the acquisition trials, resistance to extinction decreases.

If the reinforcement is delayed during acquisition trials, the resistance to extinction increases. Reinforcement in every acquisition trial makes the learned response to be less resistant to extinction. In contrast, intermittent or partial reinforcement during acquisition trials makes a learned response more resistant to extinction.

Generalisation and Discrimination

The processes of **generalisation** and **discrimination** occur in all kinds of learning. However, they have been extensively investigated in the context of conditioning. Suppose an organism is conditioned to elicit a CR (saliva secretion or any other reflexive response) on presentation of a CS (light or sound of bell). After conditioning is established, and another stimulus similar to the CS (e.g., ringing of telephone) is presented, the organism makes the conditioned response to it. *This phenomenon of responding similarly to similar stimuli is known as generalisation.* Again, suppose a child has learned the location of a jar of a certain size and shape in which sweets are kept. Even when the child's mother is not around, the child finds the jar and obtains the sweets. This is a learned operant. Now the sweets are kept in another jar of a different size and shape and at a different location in the kitchen. In the absence of the mother the child locates the jar and obtains the sweets. This is also an example of generalisation. *When a learned response occurs or is elicited by a new stimulus, it is called generalisation.*

Another process, which is complimentary to generalisation, is called discrimination. *Generalisation is due to similarity while discrimination is a response due to difference.* For example, suppose a child is conditioned to be afraid of a person with a long moustache and wearing black clothes. In subsequent situation, when s/he meets another person dressed in black clothes with a beard, the child shows signs of fear. The child's fear is generalised. S/he meets another stranger who is wearing grey clothes and is clean-shaven. The child shows no fear. This is an example of discrimination. Occurrence of generalisation means failure of discrimination. Discriminative response depends on the discrimination capacity or discrimination learning of the organism.

Spontaneous Recovery

Spontaneous recovery occurs after a learned response is extinguished. Suppose an organism has learned to make a response for getting reinforcement, then the response is extinguished and some time lapses. A question now may be asked, whether the response is completely extinguished, and will not occur if the CS is presented. It has been demonstrated that after lapse of considerable time, the learned or CR recovers and occurs to the CS. The amount of spontaneous recovery depends on the duration of the time lapsed after the extinction session. The longer the duration of time lapsed, the greater is the recovery of learned response. Such a recovery occurs spontaneously. Fig.6.3 shows the phenomenon of spontaneous recovery.

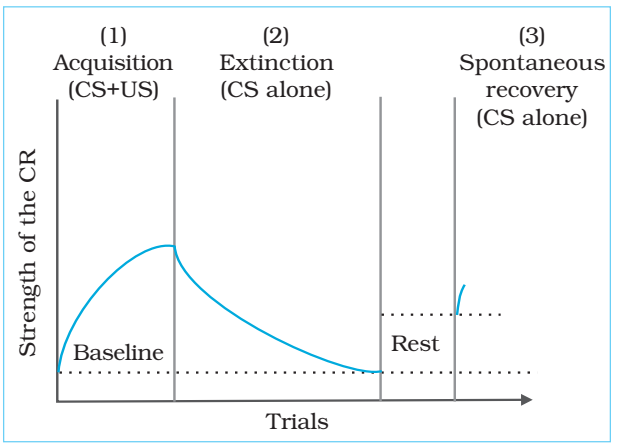

Fig.6.3 : Phenomenon of Spontaneous Recovery

Observational Learning

The next form of learning takes place by observing others. Earlier this form of learning was called **imitation**. Bandura and his colleagues in a series of experimental studies investigated observational learning in detail. In this kind of learning, human beings learn social behaviours, therefore, it is sometimes called **social learning**. In many situations individuals do not know how to behave. They observe others and emulate their behaviour. This form of learning is called **modeling**.

Examples of observational learning abound in our social life. Fashion designers employ tall, pretty, and gracious young girls and tall, smart, and well-built young boys for popularising clothes of different designs and fabrics. People observe them on televised fashion shows and advertisements in magazines and newspapers. They imitate these models. Observing superiors and likeable persons and then emulating their behaviour in a novel social situation is a common experience.

In order to understand the nature of observational learning we may refer to the studies conducted by Bandura. In one of his well-known experimental study, Bandura showed a film of five minutes duration to children. The film shows that in a large room there are numerous toys including a large sized 'Bobo' doll. Now a grown-up boy enters the room and looks around. The boy starts showing aggressive behaviour towards the toys in general and the bobo doll in particular. He hits the doll, throws it on the floor, kicking it and sitting on it. This film has three versions. In one version a group of children see the boy (model) being rewarded and praised by an adult for being aggressive to the doll. In the second version another group of children see the boy being punished for his aggressive behaviour. In the third version the third group of children are not shown the boy being either rewarded or punished.

After viewing a specific version of the film all the three groups of children were placed in an experimental room in which similar toys were placed around. The children were allowed to play with the toys. These groups were secretly observed and their behaviours noted. It was found that those children who saw aggressive behaviour being rewarded were most aggressive; children who had seen the aggressive model being punished were least aggressive. Thus, *in observational learning observers acquire knowledge by observing the model's behaviour, but performance is influenced by model's behaviour being rewarded or punished.*

You must have noticed that children observe adults' behaviours, at home and during social ceremonies and functions. They enact adults in their plays and games. For instance, young children play games of marriage ceremonies, birthday parties, thief and policeman, house keeping, etc. Actually they enact in their games what they observe in society, on television, and read in books.

Children learn most of the social behaviours by observing and emulating adults. The way to put on clothes, dress one's hair, and conduct oneself in society are learned through observing others. It has also been shown that children learn and develop various personality characteristics through observational learning. Aggressiveness, pro-social behaviour, courtesy, politeness, diligence, and indolence are acquired by this method of learning.

Activity 6.2

You can have first-hand experience of observational learning by doing the following exercise.

Collect four or five school going children and demonstrate how to make a boat out of a sheet of paper. Do it two or three times and ask the children to observe carefully. After having shown how to fold the paper in different ways for a number of times, give them sheets of paper and ask them to make a toy boat.

Most children will be able to do it somewhat successfully.

Cognitive Learning

Some psychologists view learning in terms of cognitive processes that underlie it. They have developed approaches that focus on such processes that occur during learning rather than concentrating solely on S-R and S-S connections, as we have seen in the case of classical and operant conditioning. Thus, in cognitive learning, there is a change in what the learner *knows* rather than what s/he *does*. This form of learning shows up in *insight learning* and *latent learning*.

Insight Learning

Kohler demonstrated a model of learning which could not be readily explained by conditioning. He performed a series of experiments with chimpanzees that involved solving complex problems. Kohler placed chimpanzees in an enclosed play area where food was kept out of their reach. Tools such as poles and boxes were placed in the enclosure. The chimpanzees rapidly learned how to use a box to stand on or a pole to move the food in their direction. In this experiment, learning did not occur as a result of trial and error and reinforcement, but came about in sudden flashes of insight. The chimpanzees would roam about the enclosure for some time and then suddenly would stand on a box, grab a pole and strike a banana, which was out of normal reach above the enclosure. The chimpanzee exhibited what Kohler called *insight learning* – the process by which the solution to a problem suddenly becomes clear.

In a normal experiment on insight learning, a problem is presented, followed by a period of time when no apparent progress is made and finally a solution suddenly emerges. In insight learning, sudden solution is the rule. Once the solution has appeared, it can be repeated immediately the next time the problem is confronted. Thus, it is clear that what is learned is not a specific set of conditioned associations between stimuli and responses but a cognitive relationship between a means and an end. As a result, insight learning can be generalised to other similar problem situations.

Latent Learning

Another type of cognitive learning is known as *latent learning*. In latent learning, a new behaviour is learned but not demonstrated until reinforcement is provided for displaying it. Tolman made an early contribution to the concept of latent learning. To have an idea of latent learning, we may briefly understand his experiment. Tolman put two groups of rats in a maze and gave them an opportunity to explore. In one group, rats found food at the end of the maze and soon learned to make their way rapidly through the maze. On the other hand, rats in the second group were not rewarded and showed no apparent signs of learning. But later, when these rats were reinforced, they ran through the maze as efficiently as the rewarded group.

Tolman contended that the unrewarded rats had learned the layout of the maze early in their explorations. They just never displayed their latent learning until the reinforcement was provided. Instead, the rats developed a **cognitive map** of the maze, i.e. a mental representation of the spatial locations and directions, which they needed to reach their goal.

Verbal Learning

Verbal learning is different from conditioning and is limited to human beings. Human beings, as you must have observed, acquire knowledge about objects, events, and their features largely in terms of words. Words then come to be associated with one another. Psychologists have developed a number of methods to study this kind of learning in a laboratory setting. Each method is used to investigate specific questions about learning of some kind of verbal material. In the study of verbal learning, psychologists use a variety of materials including nonsense syllables, familiar words, unfamiliar words (see Table 6.2 for sample items), sentences, and paragraphs.

Table 6.2 Sample Lists of Items used in Verbal Learning Experiments

Nonsense syllables	*Unfamiliar words*	*Familiar words*
YOL	ZILCH	BOAT
RUV	PLUMB	NOSE
TOJ	VERVE	KNOW
LIN	BLOUT	GOAL
LUF	THILL	BOWL
GOW	SCOFF	LOAD
NOK	TENOR	FEET
RIC	WRACK	MEET
NEZ	BOUGH	TENT
TAM	MALVE	FOAM
SUK	PATTER	TALE
KOZ	MANSE	JOKE
GUD	KYDRA	MALE
MUP	BORGE	BALM
KUG	DEVEN	SOLE

Methods used in Studying Verbal Learning

1. *Paired-Associates Learning* : This method is similar to S-S conditioning and S-R learning. It is used in learning some foreign language equivalents of mother tongue words. First, a list of paired-associates is prepared. The first word of the pair is used as the stimulus, and the second word as the response. Members of each pair may be from the same language or two different languages. A list of such words is given in Table 6.3.

The first members of the pairs (stimulus term) are nonsense syllables (consonant-vowel-consonant), and the second are English nouns (response term). The learner is first shown both the stimulus-response pairs together, and is instructed to remember and recall the response after the presentation of each stimulus term. After that a learning trial begins. One by one the stimulus words are presented and the participant tries to give the correct response term. In case of failure, s/he is shown the response word. In one trial all the stimulus terms are shown. Trials continue until the participant gives all the response words without a single error. The total number of trials taken to reach the criterion becomes the measure of paired-associates learning.

2. *Serial Learning* : This method of verbal learning is used to find out how participants learn the lists of verbal items, and what processes are involved in it. First, lists of verbal items, i.e. nonsense syllables, most familiar or least familiar words, interrelated words, etc. are prepared. The participant is presented the entire list and is required to produce the items in the same serial order as in the list. In the first trial, the first item of the list is shown,

Table 6.3 Examples of Stimulus – Response Pairs used in Paired-Associates Learning

Stimulus - Response	*Stimulus - Response*
GEN – LOOT	LUR – ROOF
BEM – TIME	RUL – GOLD
DIV – LAMP	VAK – HILL
WUF – DEER	KER – NAME
JIT – LION	HOZ – GOAT
DAX – COAL	MUW – BULL

and the participant has to produce the second item. If s/he fails to do so within the prescribed time, the experimenter presents the second item. Now this item becomes the stimulus and the participant has to produce the third item that is the response word. If s/he fails, the experimenter gives the correct item, which becomes the stimulus item for the fourth word. This procedure is called **serial anticipation method**. Learning trials continue until the participant correctly anticipates all the items in the given order.

3. *Free Recall* : In this method, participants are presented a list of words, which they read and speak out. Each word is shown at a fixed rate of exposure duration. Immediately after the presentation of the list, the participants are required to recall the words in any order they can. Words in the list may be interrelated or unrelated. More than ten words are included in the list. The presentation order of words varies from trial to trial. This method is used to study how participants organise words for storage in memory. Studies indicate that the items placed in the beginning or end of the lists are easier to recall than those placed in the middle, which are more difficult to recall.

Determinants of Verbal Learning

Verbal learning has been subjected to the most extensive experimental investigations. These studies have indicated that the course of verbal learning is influenced by a number of factors. The most important determinants are the different features of the verbal material to be learned. They include *length of the list to be learned* and *meaningfulness of the material*. Meaningfulness of material is measured in several ways. The number of associations elicited in a fixed time, familiarity of the material and frequency of usage, relations among the words in the list, and sequential dependence of each word of the list on the preceding words, are used for assessing meaningfulness. Lists of nonsense syllables are available with different levels of associations. The nonsense syllables should be selected from a list containing the same association value. On the basis of research findings, the following generalisations have been made.

Learning time increases with increase in length of the list, occurrence of words with low association values or lack of relations among the items in the list. The more time it takes to learn the list, stronger will be the learning. In this respect psychologists have found that the *total time principle* operates. This principle states that a fixed amount of time is necessary to learn a fixed amount of material, regardless of the number of trials into which that time is divided. *The more time it takes to learn, the stronger becomes the learning.*

If participants are not restricted to the serial learning method and are allowed to give free recall, verbal learning becomes organisational. It implies that in free recall participants recall the words not in their order of presentation, but in a new order or sequence. Bousfield first demonstrated this experimentally. He made a list of 60 words that consisted of 15 words drawn from each of the four semantic categories, i.e. names, animals, professions, and vegetables. These words were presented to participants one by one in random order. The participants were required to make free recall of the words. However, they recalled the words of each category together. He called it **category clustering**. It is worth noting that, though, the words were presented randomly the participants organised them category-wise in recall. Here category clustering occurred because of the nature of the list. It has also been demonstrated that free recall is always organised subjectively. Subjective organisation shows that the participants organise words or items in their individual ways and recall accordingly.

Verbal learning is usually intentional but a person may learn some features of the words unintentionally or incidentally. In this kind of learning, participants notice features such as whether two or more words rhyme, start with identical letters, have same vowels, etc. Thus, verbal learning is both intentional as well as incidental.

Activity 6.3

Take the following words and write them on separate cards, and ask the participants to read them aloud one by one. After completion of two readings, ask them to write down the words in any order : book, law, bread, shirt, coat, paper, pencil, biscuit, pen, life, history, rice, curd, shoes, sociology, sweet, pond, potato, ice-cream, muffler, and prose. After the presentation, ask them to write down the words they read, without bothering about the order of presentation.

Analyse your data to see whether recalled words show any organisation.

Concept Learning

The world, in which we live, consists of innumerable objects, events and living beings. These objects and events are different in their structures and functions. One of the many things human beings have to do is to organise the objects, events, animals, etc., into categories so that within the category, objects are treated as equivalent even though they are different in their features. Such categorisations involve concept learning.

What is a Concept?

*A **concept** is a category that is used to refer to a number of objects and events.* Animal, fruit, building, and crowd are examples of concepts or categories. It may be noted that the terms, concept and category, are interchangeably used. *A concept is defined as 'a set of features or attributes connected by some rule'.* Instances of a concept are those objects or events or behaviours, which have common features. *A feature is any characteristic or aspect of an object or event or living organism that is observed in them, and can be considered equivalent to some features observed or discriminated in other objects.* Features are of innumerable kinds and their discriminability depends upon the degree of the observer's perceptual sensitivity. Properties like colour, size, number, shape, smoothness, roughness, softness, and hardness are called features.

Rules that are used to connect the features to form a concept may be very simple or complex. *A rule is an instruction to do something.* Keeping in view the rules that are used in defining concepts, psychologists have studied two types of concepts : **artificial concepts** and **natural concepts** or categories. Artificial concepts are those that are well-defined and rules connecting the features are precise and rigid. *In a well-defined concept the features that represent the concept are both singly necessary and jointly sufficient.* Every object must have all the features in order to become an instance of the concept. On the other hand, natural concepts or categories are usually ill-defined. Numerous features are found in the instances of a natural category. Such concepts include biological objects, real world products, and human artefacts such as tools, clothes, houses, etc.

Let us take the example of the concept of a square. It is a well-defined concept. It must have four attributes, i.e. closed figure, four sides, each side of equal length, and equal angles. Thus a square consists of four features connected by a **conjunctive rule**. In order to understand various rules for creating well-defined concepts let us look at Figure 6.4.

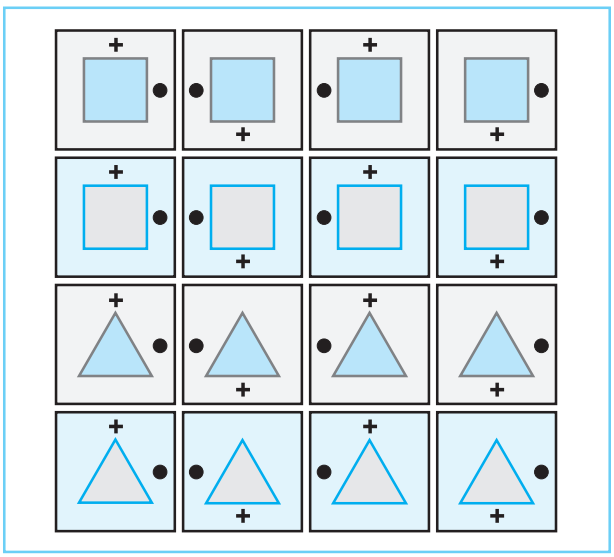

Fig.6.4 : Sixteen figures containing two shapes – square and triangle, two shades – pink and grey, cross on top and bottom, circles – right or left sides of figures. These figures are used as instances of and non-instances of an artificial concept.

In Figure 6.4 there are 16 cards having two shapes - square and triangle, two shades-pink and grey, signs of cross on top or bottom, and small circle on right side or left side. With the help of these cards one can create a number of concepts by using different rules. The set of features that are connected by some rule are called **relevant features**. The features that are not included in the rule are considered to be irrelevant features. For example, in the cards shown in Figure 6.4 there are four features — shape, shade, cross or no cross on the top, and circle on the right or left side. In creating a **conjunctive concept** by using two features one may use shape and side as the relevant ones, and leave out two others as irrelevant. For such a concept, the exemplars and non-exemplars are given in Figure 6.5. You will study more about concepts in Chapter 8 on thinking.

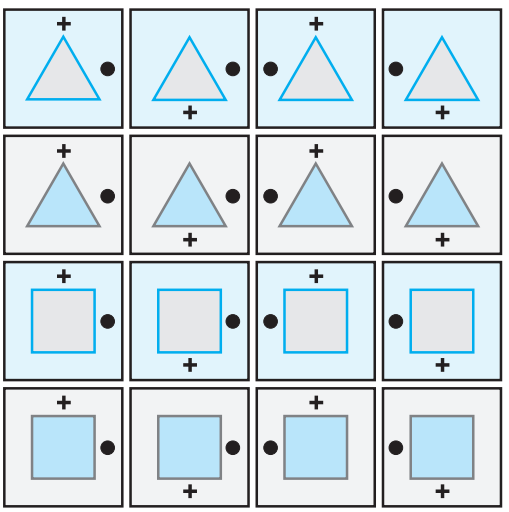

Fig.6.5 : The four figures on the top are the exemplars of the concept, and rest of the figures are non-exemplars. The exemplars of the concept must be triangle and grey. Other features are irrelevant.

Skill Learning

Nature of Skills

A skill is defined as the ability to perform some complex task smoothly and efficiently. Car driving, airplane piloting, ship navigating, shorthand writing, and writing and reading are examples of skills. Such skills are learned by practice and exercise. *A skill consists of a chain of perceptual motor responses or as a sequence of S-R associations.*

Phases of Skill Acquisition

Skill learning passes through several qualitatively different phases. With each successive attempt at learning a skill, one's performance becomes smoother and less effort demanding. In other words, it becomes more spontaneous or automatic. It has also been shown that in each phase the performance improves. In transition from one phase to the next, when the level of performance stands still, it is called performance plateau. Once the next phase begins, performance starts improving and its level starts going up.

One of the most influential accounts of the phases of skill acquisition is presented by Fitts. According to him, skill learning passes through three phases, viz. **cognitive**, **associative** and **autonomous**. Each phase or stage of skill learning involves different types of mental processes. In the cognitive phase of skill learning, the learner has to understand and memorise the instructions, and also understand how the task has to be performed. In this phase, every outside cue, instructional demand, and one's response outcome have to be kept alive in consciousness.

The second phase is associative. In this phase, different sensory inputs or stimuli are linked with appropriate responses. As the practice increases, errors decrease, performance improves and time taken is also reduced. With continued practice, errorless performance begins, though, the learner has to be attentive to all the sensory inputs and maintain concentration on the task. Then the third phase, i.e. autonomous phase, begins. In this phase, two important changes take place in performance: the **attentional demands** of the associative phase decrease, and interference created by external factors reduces. Finally, skilled performance attains **automaticity** with minimal demands on conscious effort.

Transitions from one phase to the other clearly show that practice is the only means of skill learning. One has to keep on exercising and practicing. As the practice increases, improvement rate gradually increases; and automaticity of errorless performance becomes the hallmark of skill. That is why it is said that 'practice makes a man perfect'.

Transfer of Learning

The term transfer of learning is often called transfer of training or transfer effect. It refers to the *effects of prior learning on new learning*. Transfer is considered to be positive if the earlier learning facilitates current learning. It is considered to be negative transfer if new learning is retarded. Absence of facilitative or retarding effect means zero transfer. Psychologists use specific experimental designs in the study of transfer effects. One such design is presented in Table 6.4

Suppose you want to know whether learning of English language affects learning of French. To study this you select a large sample of participants. Now you randomly divide the sample into two groups, one to be used in the experimental condition and the other as control group. The experimental group of participants learn English language for a year and is tested to find out their achievement in English. In the second year, they study French. In the end this group is tested to find out its achievement scores in French. The control group in the first phase does not learn English language and just does its routine work for one year. In the second year, these participants learn French for a year and their achievement scores are obtained. The achievement scores in French of the two groups are then compared. If the achievement score of the experimental group is higher than that of the control group, it implies that positive transfer has taken place. If the score is lower than the control group, it means negative transfer has taken place. If the two groups perform equally well, then it shows that transfer effect is zero.

It must be noted that in the study of transfer effect, a distinction is made between **general transfer** and **specific transfer**. It is now a well-known fact that prior learning always leads to positive general transfer. It is only in specific transfer that transfer effects are positive or negative, and in some conditions there is zero effect, though in reality, due to general transfer, zero transfer is theoretically untenable. Let us try to understand the nature of general transfer and specific transfer.

General (Generic) Transfer

General transfer is not clearly conceptualised and defined in its details. However, prior learning predisposes one to learn another task in a better manner. The learning of one task warms-up the learner to learn the next task more conveniently. You must have seen a cricketer going to the pitch to take her/his position near the wicket. The cricketer walks by jumping on one foot then on the other. S/he moves her/his two hands holding the bat sideways to loosen up. When you write answers while appearing at the examination, your writing is slow and sitting position awkward for efficient writing. However, you get warmed up after having written two or three pages. Your speed increases and your body gets well adjusted to the writing task. This continues until the writing of the last answer is over. After some time, warm-up effect disappears. Warm-up effect lasts over one session of

Table 6.4 Experimental Design used in the Study of Transfer Effects of Learning

Group of Participants	*Phase 1*	*Phase 2*
Experimental	Learns task A	Learns task B
Control	Does not learn but rests	Learns task B

learning. Only in that session one can learn two or more tasks.

Specific Transfer

Whenever an organism learns something, it consists of a series of stimulus-response associations. Any task can be understood as a chain of discriminable stimuli, each of which has to be associated with a specific response. Specific transfer means the effect of learning of task A on learning of task B. The learning of task A may make the learning of task B easier or more difficult or have no such effect. Such transfers depend on similarity-dissimilarity between the initial learning task and the second task. The possible relationships between stimuli and responses are shown in Table 6.5.

3. In the third case, the stimuli are same but responses are different. In such conditions also some positive transfer occurs.
4. In the fourth case, the stimuli are different, but responses are the same. Therefore new associations with responses are to be learned. In this case positive transfer is obtained.
5. In the fifth case, stimuli and responses are the same, but associations are altered. Because of this alteration, negative transfer occurs in the learning of the second task. It is so because the associations learned in the initial task interfere in the learning of new associations. Such interferences are discussed in Chapter 7 which deals with human memory.

Table 6.5 Similarity–Dissimilarity Relationship between the Initial and Subsequent Learning Tasks

S.No.	*Initial Task*	*Second Task*	*Comments*
1.	$S_A - R_A$	$S_C - R_D$	Both stimuli and responses are different
2.	$S_A - R_A$	$S_A - R_A$	Stimuli are the same and responses are similar
3.	$S_A - R_A$	$S_A - R_D$	Stimuli same but responses are different
4.	$S_A - R_A$	$S_C - R_A$	Stimuli are different but responses same
5.	$S_A - R_A$	$S_A - R_A$	Same stimuli and responses but associations interchanged

On the basis of a long series of experimental studies, the following conclusions have been drawn about specific transfer with reference to the situations shown in Table 6.5.

1. In the first instance, the initial and transfer tasks are very different both in stimuli as well as in responses. Hence no specific transfer is expected. However, due to the mechanism of general transfer some degree of positive transfer may occur.
2. In the second case, the stimuli of the two tasks are the same and responses are highly similar. Therefore, maximum transfer may occur. It has been regularly shown that in this condition positive transfer takes place.

Factors Facilitating Learning

In the preceding section we examined the specific determinants of learning, such as contiguous presentation of CS and US in classical conditioning; number, amount, and delay of reinforcement in operant conditioning; status and attractiveness of models in observational learning; procedure in verbal learning; and the nature of rules and perceptual features of objects and events in concept learning. Now, we shall discuss some general determinants of learning. This discussion is not exhaustive. Rather it deals with some salient factors only which are found very important.

Continuous vs Partial Reinforcement

In experiments on learning the experimenter can arrange to deliver reinforcement according to a specific schedule. In the context of learning, two kinds of schedules namely **continuous** and **partial** have been found very important. In continuous reinforcement the participant is given reinforcement after each target response. This kind of schedule of reinforcement produces a high rate of responding. However, once the reinforcement is withheld, response rates decrease very quickly, and the responses acquired under this schedule tend to extinguish. Since organism is getting reinforcement on each trial, the effectiveness of that reinforcer is reduced. In such schedules where reinforcement is not continuous, some responses are not reinforced. Hence, they are called partial or intermittent reinforcement. There are several ways in which one might reinforce responses according to an intermittent schedule. It has been found that partial reinforcement schedules often produce very high rates of responding, particularly when responses are reinforced according to ratio. In this kind of schedule, an organism often makes several responses that are not reinforced. Therefore, it becomes difficult to tell when a reinforcement has been discontinued completely and when it has merely been delayed. When reinforcement is continuous it is easier to tell when it has been discontinued. This kind of difference has been found crucial for extinction. It has been found that *extinction of a response is more difficult following partial reinforcement than following continuous reinforcement*. The fact that the responses acquired under partial reinforcement are highly resistant to extinction is called **partial reinforcement effect**.

Motivation

All living organisms have survival needs and human beings, in addition, have growth needs. Motivation is a mental as well as a physiological state, which arouses an organism to act for fulfilling the current need. In other words, motivation energises an organism to act vigorously for attaining some goal. Such acts persist until the goal is attained and the need is satisfied. Motivation is a prerequisite for learning. Why does a child forage in the kitchen when the mother is not in the house? S/he does so because s/he needs sweets to eat for which s/he is trying to locate the jar in which sweets are kept. During the course of foraging the child learns the location of the jar. A hungry rat is placed in a box. The animal forages in the box for food. Incidentally it presses a lever and food drops in the box. With repeated experience of such activity, the animal learns to press the lever immediately after the animal is placed there.

Have you ever asked yourself why you are studying psychology and other subjects in Class XI? You are doing so to pass with good marks or grades in your final examination. The more motivated you are, the more hard work you do for learning. Your motivation for learning something arises from two sources. You learn many things because you enjoy them (intrinsic motivation) or they provide you the means for attaining some other goal (extrinsic motivation).

Preparedness for Learning

The members of different species are very different from one another in their sensory capacities and response abilities. The mechanisms necessary for establishing associations, such as S-S or S-R, also vary from species to species. It can be said that species have biological constraints on their learning capacities. The kinds of S-S or S-R learning an organism can easily acquire depends on the associative mechanism it is genetically endowed with or prepared for. A particular kind of associative learning is easy for apes or human beings but may be extremely difficult and sometimes impossible for cats and rats. It implies that one can learn only those associations for which one is genetically prepared.

The concept of preparedness may be best understood as a continuum or dimension, on one end of which are those learning tasks or associations which are easy for the members of some species, and on the other end are those learning tasks for which those members are not prepared at all and cannot learn them. In the middle of the continuum fall those tasks and associations for which the members are neither prepared nor unprepared. They can learn such tasks, but only with great difficulty and persistence.

The Learner : Learning Styles

You may have observed that some children, sometimes from the same family, perform well in school whereas others do not. There has been a great deal of research on *learning styles* over the last several decades. It demonstrates the differences in the way people learn within the same class, culture, community or socio-economic group and those belonging to different groups.

Learning style may be defined as *'a learner's consistent way of responding to and using stimuli in the context of learning'*. In other words, it is *'the way in which each learner begins to concentrate, processes, and retains new and complex information'*. It may be noted that this interaction occurs differently for everyone. For example, you may have noticed that children in your class are unique in their personalities, cultural experiences, and values. Different students prefer different learning environments, learning modalities and they all have unique strengths, talents, and weaknesses.

Therefore, it is necessary to examine each individual's personal characteristics to determine what is most likely to trigger each learner's concentration, maintain it, respond to her or his natural processing style and facilitate long-term memory. There are various instruments which are used to determine a student's learning style.

Learning styles are mainly derived from Perceptual Modality, Information Processing, and Personality Patterns. A brief description of these approaches are given below:

1. *Perceptual Modality* are biologically-based reactions to the physical environment. It refers to the preferences of persons through which they take in information such as auditory, visual, smell, kinesthetic, and tactile.
2. *Information Processing* distinguishes between the way we are structured to think, solve problems, and remember information. This may be thought of as the way we process information. For example, active/reflective, sensing/intuitive, sequential/global, serial/simultaneous, etc.
3. *Personality Patterns* are the way we interact with our surroundings. Each one of us has a preferred, consistent, and distinct way of perceiving, organising, and retaining information. This approach focuses on understanding how personality affects the way people interact with the environment, and how this affects the way individuals respond to each other within the learning environment.

There are several dimensions along which learning styles differ. For example, Anderson differentiated between *analytic* and *relational* styles of learning. These have been illustrated in Table 6.6. It is clear that people with a relational style learn material best through exposure to a full unit or phenomenon. They comprehend parts of the unit only by understanding their relationship to the whole. On the other hand, people with an analytical learning style learn more easily when information is presented step by step in a cumulative sequential pattern that builds towards a conceptual understanding.

One must remember that the various learning styles are points along a scale that help us to discover the different forms of mental representation. They do not characterise people. Therefore, we should not divide the population into a set category (e.g., visual person, extrovert, etc.). We are capable of learning under any style, no matter what our preference may be.

Table 6.6 Learning Styles

Relational Style	*Analytical Style*
1. Perceive information as part of total picture	1. Able to disembed information from total picture (focus on detail)
2. Exhibit intuitive thinking	2. Exhibit sequential and structured thinking
3. Learn materials that have a human, social content and are characterised by experiential/cultural relevance more easily	3. Learn materials that are inanimate and impersonal more easily
4. Have a good memory for verbally presented ideas and information, especially if relevant	4. Have a good memory for abstract ideas and irrelevant information
5. Are more task-oriented concerning non-academic areas	5. Are more task-oriented concerning academics
6. Are influenced by authority figures' expression of confidence or doubt in students' ability	6. Are not greatly affected by the opinions of others
7. Prefer to withdraw from unstimulating task performance	7. Show ability to persist unstimulating task
8. Style conflicts with the traditional school environment	8. Style matches most school environments

Learning Disabilities

You must have heard, observed or read that thousands of children get enrolled for education in schools. Some of them, however, find the demands of educational process too difficult to meet, and they drop out. Such students are called "drop-outs". The reasons for this are numerous, such as sensory impairment, intellectual disability, social and emotional disturbance, poor economic conditions of the family, cultural beliefs and norms or other environmental influences. Apart from these conditions, there is another source of obstacle in the continuance of education that is called learning disabilities. It makes school learning, i.e. acquisition of knowledge and skills too difficult to grapple with. Such children also fail to move forward in their learning activities.

Learning disability is a general term. It refers to a heterogeneous group of disorders manifested in terms of difficulty in the acquisition of learning, reading, writing, speaking, reasoning, and mathematical activities. The sources of such disorders are inherent in the child. It is presumed that these difficulties originate from problems with the functioning of the central nervous system. It may occur in conjunction with physical handicaps, sensory impairment, intellectual disability or without them.

It must be noted that learning disabilities may be observed as a distinct handicapping condition in children of average to superior intelligence, adequate sensory motor systems, and adequate learning opportunities. If it is not remedied, it may continue throughout life and affect self-esteem, vocation, social relations, and daily living activities.

Symptoms of Learning Disabilities

There are many symptoms of learning disabilities. They become manifest in different combinations in children who suffer from this disorder irrespective of their intelligence, motivation, and hard work for learning.

1. Difficulties in writing letters, words and phrases, reading out text, and speaking appear quite frequently. Quite often they have listening problems, although they may not have auditory defects. Such

children are very different from others in developing learning strategies and plans.

2. Learning-disabled children have disorders of attention. They get easily distracted and cannot sustain attention on one point for long. More often than not, attentional deficiency leads to hyperactivity, i.e. they are always moving, doing different things, trying to manipulate things incessantly.
3. Poor space orientation and inadequate sense of time are common symptoms. Such children do not get easily oriented to new surroundings and get lost. They lack a sense of time and are late or sometimes too early in their routine work. They also show confusion in direction and misjudge right, left, up and down.
4. Learning-disabled children have poor motor coordination and poor manual dexterity. This is evident in their lack of balance, inability to sharpen pencil, handle doorknobs, difficulty in learning to ride a bicycle, etc.
5. These children fail to understand and follow oral directions for doing things.
6. They misjudge relationships as to which classmates are friendly and which ones are indifferent. They fail to learn and understand body language.
7. Learning-disabled children usually show perceptual disorders. These may include visual, auditory, tactual, and kinesthetic misperception. They fail to differentiate a call-bell from the ring of the telephone. It is not that they do not have sensory acuity. They simply fail to use it in performance.
8. Fairly large number of learning-disabled children have **dyslexia**. They quite often fail to copy letters and words; for example, they fail to distinguish between *b* and *d*, *p* and *q*, *P* and *9*, *was* and *saw*, *unclear* and *nuclear,* etc. They fail to organise verbal materials.

It must be noted that learning disabilities are not incurable. Remedial teaching methods go a long way in helping them to learn and become like other students. Educational psychologists have developed appropriate techniques for correcting most of the symptoms related to learning disabilities.

Applications of Learning Principles

The principles of learning have great value for enriching human life in all spheres of life. All activities and behaviours that make personal, social, and economic life peaceful and pleasurable are learned. Their learning should be psychologically guided. Contemporary psychologists have developed techniques and procedures based on the principles of classical and operant conditioning, social learning, verbal learning, concept learning, and skill learning for improving many aspects of life. We can have a glimpse of the applications of learning principles in four areas, i.e. organisations, in treatment of maladjustive behaviours, in rearing children, and school learning.

In organisations, a number of problems such as absenteeism, frequent medical leave, indiscipline, and lack of proper skills pose serious problems. Applying the principles of learning may solve these problems. To increase attendance and reduce absenteeism, an interesting device is used in some organisations. At the end of every third month, name slips of employees, not being absent on a single working day are placed in a drum. Four to five per cent of the names are randomly drawn and they are given attractive **rewards** for not being absent on a single working day. Such rewards have been found to reduce absenteeism. To increase the number of employees, who have not gone on medical leave for full one year, various benefits are given. Such partial rewards reduce the incidence of medical leave. With a view to improving discipline, managers start functioning as models for employees, or employees are placed under such model managers.

Based on the principles of learning, a number of therapeutic procedures have been developed to modify maladaptive and socially incapacitating habits and behaviours. In these procedures, the principle of **extinction** is employed. In the case of those children and

adults who exhibit irrational and unfounded fear with accompanying avoidance behaviour, **implosive therapy** and **flooding** are used. Implosive therapy starts with the person imagining their most feared form of contact with the feared object, accompanied by vivid verbal descriptions by the therapist. The therapist functions as a coach. On the other hand, flooding is exposure that takes place *in vivo* (e.g., with an actual feared object) and is considered to be the most effective of all treatments for fear. To help those suffering from excessive anxieties and fears, the technique of **systematic desensitisation** is used. It is a form of behaviour therapy used to reduce phobic patients' anxiety responses through counterconditioning, i.e. an attempt to reverse the process of classical conditioning by associating the crucial stimulus with a new conditioned response. In order to eliminate habits that are undesirable and injurious for health and happiness, **aversion therapy** is used. The therapist arranges things in such a way that occurrence of maladjustive habits generates painful experiences and to avoid them clients learn to give them up. For example, alcohol is paired with an emetic drug (which induces severe nausea and vomiting) so that nausea and vomiting become a conditioned response to alcohol. **Modeling** and systematic use of **reinforcement** for shaping and developing competence are extensively used. Persons suffering from excessive shyness and having difficulties in interpersonal interactions are subjected to **assertive learning**. This therapy is also based on the principles of learning. There are persons who lose mental peace with accelerated rate of breathing, loss of appetite, and rise in blood pressure at the slightest provocation. In such cases psychotherapists give **biofeedback** treatment. This technique is based on the interaction between classical and instrumental conditioning. In biofeedback, a bodily function (such as heart rate or blood pressure) is monitored and information about the function is fed back to the person to facilitate improved control of the physiological process. You will read in detail about these therapies in Class XII.

The principles of learning are widely used in teaching. Educational objectives are decided after analysing the instructional tasks and fitting them into various types of learning such as S-S or S-R, verbal, observational, and skill learning. Students are told what they have to learn and **appropriate practice conditions** are provided. Students are made active participants in the acquisition of information, meaning, and correct responses. Teachers act as **models** and **mentors** for students to emulate them with a view to promote appropriate social behaviours and personal habits. Students are provided ample opportunities for practice as they are required to do homework. Skills are analysed as S-R chains and students are allowed to learn skills practically.

The principles of learning are best applied in child rearing, provided both the parents are aware of the principles of learning. By using the classical conditioning procedure children are made to learn necessary signs of danger and safety. The behaviour of children can easily be modified and shaped through the use of operant conditioning procedure. By using rewards judiciously parents can make children enthusiastic learners. As models and mentors, parents make children socially skillful, duty oriented and resourceful.

Key Terms

Associative learning, Biofeedback, Cognitive map, Concept, Conditioned response, Conditioned stimulus, Conditioning, Discrimination, Dyslexia, Extinction, Free recall, Generalisation, Insight, Learning disabilities, Mental set, Modeling, Negative reinforcement, Operant or instrumental conditioning, Positive reinforcement, Punishment, Reinforcement, Serial learning, Spontaneous recovery, Transfer of learning, Unconditioned response, Unconditioned stimulus, Verbal learning

Summary

- *Learning is any relatively permanent change in behaviour or behavioural potential produced by experience or practice. It is an inferred process and differs from performance which is the observed behaviour/response/action.*
- *The main types of learning are: classical and operant conditioning, observational learning, cognitive learning, verbal learning, concept learning, and skill learning.*
- *Pavlov first investigated classical conditioning in the course of studies on digestion in dogs. In this kind of learning an organism comes to associate stimuli. A neutral stimulus (CS) that signals an unconditioned stimulus (US) begins to produce a response (CR) that anticipates and prepares the organism for US.*
- *Skinner first investigated operant or instrumental conditioning (OC). An operant is any response voluntarily emitted by an organism. OC is a type of learning in which response is strengthened if followed by reinforcement. A reinforcer can be any event that increases the frequency of preceding response. Thus, the consequence of a response is crucial. The rate of OC is influenced by the type, number, schedule, and delay of reinforcement.*
- *Observational learning is also known as imitation, modeling and social learning. We acquire knowledge by observing a model's behaviour. The performance depends on whether the model's behaviour is rewarded or punished.*
- *In verbal learning words get associated with one another on the basis of structural, phonetic, and semantic similarity and contrast. They are often organised in clusters. In experimental studies, paired-associates learning, serial learning, and free recall methods are used. Meaningfulness of material, and subjective organisation influence learning. It may be incidental also.*
- *Concept is a category. It involves a set of features connected with a rule or instruction. A concept can be natural or artificial. Artificial concepts are well-defined while natural concepts are usually ill-defined. Experimental studies of well-defined concepts have been undertaken through selection and reception procedures. The natural concepts have fuzzy boundaries.*
- *Skill refers to the ability to carry out complex tasks smoothly and efficiently. They are learned by practice and exercise. The skilled performance is the organisation of S-R chain into large response patterns. It passes through cognitive, associative, and autonomous phases.*
- *Effect of prior learning on new learning is called transfer of learning. It may be general (e.g., warm-up) or specific. It depends on similarity of S-R associations in the two learning tasks.*
- *Factors facilitating learning include motivation and preparedness of the organism.*
- *Learning style refers to the way in which each learner begins to concentrate on, process, and retain new and difficult information.*
- *Learning disabilities (e.g., reading, writing) restrict learning in people. They are hyperactive, lack sense of time, and eye-hand coordination, etc.*
- *The principles of learning are applied in organisations, treatment of maladjustive reactions, child rearing, and school learning.*

Review Questions

1. What is learning? What are its distinguishing features?
2. How does classical conditioning demonstrate learning by association?
3. Define operant conditioning. Discuss the factors that influence the course of operant conditioning.
4. A good role model is very important for a growing up child. Discuss the kind of learning that supports it.
5. Explain the procedures for studying verbal learning.
6. What is a skill? What are the stages through which skill learning develops?

7. How can you distinguish between generalisation and discrimination?
8. How does transfer of learning takes place?
9. Why is motivation a prerequisite for learning?
10. What does the notion of preparedness for learning mean?
11. Explain the different forms of cognitive learning?
12. How can we identify students with learning disabilities?

Project Ideas

1. How do your parents reinforce you for behaving in the ways they think are good for you? Select five different instances. Compare these with the reinforcement employed by teachers in the classroom and relate them to the concepts taught in the class.
2. If your younger sister or brother has indulged in some undesirable behaviour, how would you help her/him to get rid of that behaviour. Make use of the learning principles discussed in the chapter.

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Chapter 7

Human Memory

After reading this chapter, you would be able to

- understand the nature of memory,
- distinguish between different types of memory,
- explain how the contents of long-term memory are represented and organised,
- appreciate the constructive and reconstructive processes in memory,
- understand the nature and causes of forgetting, and
- learn the strategies for improving memory.

The advantage of bad memory is that one enjoys several times, the same good things for the first time.

– Friedrich Nietzsche

Contents

Introduction
Nature of Memory
Information Processing Approach : The Stage Model
Memory Systems : Sensory, Short-term and Long-term Memories
Working Memory (Box 7.1)
Levels of Processing
Types of Long-term Memory
Declarative and Procedural; Episodic and Semantic
Long-term Memory Classification (Box 7.2)
Methods of Memory Measurement (Box 7.3)
Knowledge Representation and Organisation in Memory
Memory Making: Eyewitness and False Memories (Box 7.4)
Memory as a Constructive Process
Nature and Causes of Forgetting
Forgetting due to Trace Decay, Interference and Retrieval Failure
Repressed Memories (Box 7.5)
Enhancing Memory
Mnemonics using Images and Organisation

Key Terms
Summary
Review Questions
Project Ideas

Introduction

All of us are aware of the tricks that memory plays on us throughout our lives. Have you ever felt embarrassed because you could not remember the name of a known person you were talking to? Or anxious and helpless because everything you memorised well the previous day before taking your examination has suddenly become unavailable? Or felt excited because you can now flawlessly recite lines of a famous poem you had learnt as a child? Memory indeed is a very fascinating yet intriguing human faculty. It functions to preserve our sense of who we are, maintains our interpersonal relationships and helps us in solving problems and taking decisions. Since memory is central to almost all cognitive processes such as perception, thinking and problem solving, psychologists have attempted to understand the manner in which any information is committed to memory, the mechanisms through which it is retained over a period of time, the reasons why it is lost from memory, and the techniques which can lead to memory improvement. In this chapter, we shall examine all these aspects of memory and understand various theories which explain the mechanisms of memory.

The history of psychological research on memory spans over hundred years. The first systematic exploration of memory is credited to Hermann Ebbinghaus, a German psychologist of late nineteenth century (1885). He carried out many experiments on himself and found that we do not forget the learned material at an even pace or completely. Initially the rate of forgetting is faster but eventually it stabilises. Another view on memory was suggested by Frederick Bartlett (1932) who contended that memory is not passive but an active process. With the help of meaningful verbal materials such as stories and texts, he demonstrated that memory is a constructive process. That is, what we memorise and store undergoes many changes and modifications over time. So there is a qualitative difference in what was initially memorised by us and what we retrieve or recall later. There are other psychologists who have influenced memory research in a major way. We shall review their contributions in this chapter at appropriate places.

Nature of Memory

Memory refers to retaining and recalling information over a period of time, depending upon the nature of cognitive task you are required to perform. It might be necessary to hold an information for a few seconds. For example, you use your memory to retain an unfamiliar telephone number till you have reached the telephone instrument to dial, or for many years you still remember the techniques of addition and subtraction which you perhaps learned during your early schooling. Memory is conceptualised as a process consisting of three independent, though interrelated stages. These are **encoding**, **storage**, and **retrieval**. Any information received by us necessarily goes through these stages.

(a) *Encoding* is the first stage which refers to a process by which information is recorded and registered for the first time so that it becomes usable by our memory system. Whenever an external stimulus impinges on

our sensory organs, it generates neural impulses. These are received in different areas of our brain for further processing. In encoding, incoming information is received and some meaning is derived. It is then represented in a way so that it can be processed further.

(b) *Storage* is the second stage of memory. Information which was encoded must also be stored so that it can be put to use later. Storage, therefore, refers to the process through which information is retained and held over a period of time.

(c) *Retrieval* is the third stage of memory. Information can be used only when one is able to recover it from her/his memory. Retrieval refers to bringing the stored information to her/his awareness so that it can be used for performing various cognitive tasks such as problem solving or decision-making. It may be interesting to note that memory failure can occur at any of these stages. You may fail to recall an information because you did not encode it properly, or the storage was weak so you could not access or retrieve it when required.

Information Processing Approach : The Stage Model

Initially, it was thought that memory is the capacity to store all information that we acquire through learning and experience. It was seen as a vast storehouse where all information that we knew was kept so that we could retrieve and use it as and when needed. But with the advent of the computer, human memory came to be seen as a system that processes information in the same way as a computer does. Both register, store, and manipulate large amount of information and act on the basis of the outcome of such manipulations. If you have worked on a computer then you would know that it has a temporary memory (random access memory or RAM) and a permanent memory (e.g., a hard disk). Based on the programme commands, the computer manipulates the contents of its memories and displays the output on the screen. In the same way, human beings too register information, store and manipulate the stored information depending on the task that they need to perform. For example, when you are required to solve a mathematical problem, the memory relating to mathematical operations, such as division or subtraction are carried out, activated and put to use, and receive the output (the problem solution). This analogy led to the development of the first model of memory, which was proposed by Atkinson and Shiffrin in 1968. It is known as **Stage Model**.

Memory Systems : Sensory, Short-term and Long-term Memories

According to the Stage Model, there are three memory systems : the **Sensory Memory**, the **Short-term Memory** and the **Long-term Memory**. Each of these systems have different features and perform different functions with respect to the sensory inputs (see Fig.7.1). Let us examine what these systems are:

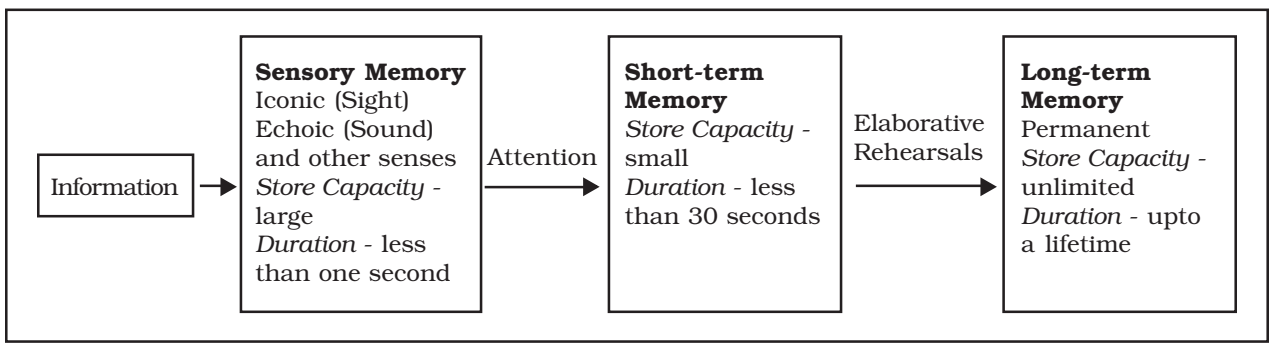

Fig.7.1 : The Stage Model of Memory

Sensory Memory

The incoming information first enters the *sensory memory*. Sensory memory has a large capacity. However, it is of very short duration, i.e. less than a second. It is a memory system that registers information from each of the senses with reasonable accuracy. Often this system is referred to as sensory memories or sensory registers because information from all the senses are registered here as exact replica of the stimulus. If you have experienced visual after-images (the trail of light that stays after the bulb is switched off) or when you hear reverberations of a sound when the sound has ceased, then you are familiar with iconic (visual) or echoic (auditory) sensory registers.

Short-term Memory

You will perhaps agree that we do not attend to all the information that impinge on our senses. Information that is attended to enters the second memory store called the *short-term memory* (abbreviated as STM), which holds small amount of information for a brief period of time (usually for 30 seconds or less). Atkinson and Shiffrin propose that information in STM is primarily encoded acoustically, i.e. in terms of sound and unless rehearsed continuously, it may get lost from the STM in less than 30 seconds. Note that the STM is fragile but not as fragile as sensory registers where the information decays automatically in less than a second.

Long-term Memory

Materials that survive the capacity and duration limitations of the STM finally enter the *long-term memory* (abbreviated as LTM) which has a vast capacity. It is a permanent storehouse of all information that may be as recent as what you ate for breakfast yesterday to as distant as how you celebrated your sixth birthday. It has been shown that once any information enters the long-term memory store it is never forgotten because it gets encoded semantically, i.e. in terms of the meaning that any information carries. What you experience as forgetting is in fact retrieval failure; for various reasons you cannot retrieve the stored information. You will read about retrieval related forgetting later in this chapter.

So far we have only discussed the structural features of the stage model. Questions which still remain to be addressed are how does information travel from one store to another and by what mechanisms it continues to stay in any particular memory store. Let us examine the answers to these questions.

How does information travel from one store to another? As an answer to this question, Atkinson and Shiffrin propose the notion of **control processes** which function to monitor the flow of information through various

Box 7.1 Working Memory

In recent years, psychologists have suggested that the short-term memory is not unitary, rather it may consist of many components. This multi-component view of short-term memory was first proposed by Baddeley (1986) who suggested that the short-term memory is not a passive storehouse but rather a work bench that holds a wide variety of memory materials that are constantly handled, manipulated and transformed as people perform various cognitive tasks. This work bench is called the working memory. The first component of the working memory is the phonological loop which holds a limited number of sounds and unless rehearsed they decay within 2 seconds. The second component visuospatial sketchpad stores visual and spatial information and like phonological loop the capacity of the sketchpad too is limited. The third component, which Baddeley calls the Central Executive, organises information from phonological loop, visuospatial sketchpad as well as from the long-term memory. Like a true executive, it allocates attentional resources to be distributed to various information needed to perform a given cognitive operation and monitors, plans, and controls behaviour.

memory stores. As suggested earlier, all informations which our senses receive are not registered; if that be the case, imagine the kind of pressure that our memory system will have to cope with. Only that information which is attended to enters the STM from sensory registers and in that sense, *selective attention*, as you have already read in Chapter 5, is the first control process that decides what will travel from sensory registers to STM. Sense impressions, which do not receive attention, fade away quickly. The STM then sets into motion another control process of **maintenance rehearsal** to retain the information for as much time as required. As the name suggests, these kinds of rehearsals simply maintain information through repetition and when such repetitions discontinue the information is lost. Another control process, which operates in STM to expand its capacity, is **Chunking**. Through chunking it is possible to expand the capacity of STM which is otherwise 7 ± 2. For example, if you are told to remember a string of digits such as 194719492004 (note that the number exceeds the capacity of STM), you may create the chunks as 1947, 1949, and 2004 and remember them as the year when India became independent, the year when the Indian Constitution was adopted, and the year when the tsunami hit the coastal regions of India and South East Asian countries.

From the STM, information enters the long-term memory through **elaborative rehearsals**. As against maintenance rehearsals, which are carried through silent or vocal repetition, this rehearsal attempts to connect the 'to be retained information' to the already existing information in long-term memory. For example, the task of remembering the meaning of the word 'humanity' will be easier if the meanings of concepts such as 'compassion', 'truth' and 'benevolence' are already in place. The number of associations you can create around the new information will determine its permanence. In elaborative rehearsals one attempts to analyse the information in terms of various associations it arouses. It involves organisation of the incoming information in as many ways as possible. You can expand the information in some kind of logical framework, link it to similar memories or else can create a mental image. Figure 7.1, that presents the stage model of memory, also depicts the arrows to show the manner in which information travels from one stage to another.

Experiments, which were carried out to test the stage model of memory, have produced mixed results. While some experiments unequivocally show that the STM and LTM are indeed two separate memory stores, other evidences have questioned their distinctiveness. For example, earlier it was shown that in the STM information is encoded acoustically, while in LTM it is encoded semantically, but later experimental evidences show that information can also be encoded semantically in STM and acoustically in LTM.

Activity 7.1

I. *Try to remember the following list of digits (individual digits)*

1 9 2 5 4 9 8 1 1 2 1

Now try to memorise them in the following groups:

1 9 25 49 81 121

Finally memorise them in the following manner:

$1^2\ 3^2\ 5^2\ 7^2\ 9^2\ 11^2$

What difference do you observe?

II. *Read out the lists given below in a row at the speed of one digit per second to your friend and ask her/him to repeat all the digits in the same order:*

List	*Digits*
1 (6 digits)	*2-6-3-8-3-4*
2 (7 digits)	*7-4-8-2-4-1-2*
3 (8 digits)	*4-3-7-2-9-0-3-6*
4 (10 digits)	*9-2-4-1-7-8-2-6-5-3*
5 (12 digits)	*8-2-5-4-7-4-7-7-3-9-1-6*

Remember that your friend will recall the digits as soon as you finish the list. Note how many digits are recalled. The memory score of your friend will be the number of digits correctly recalled by her/him. Discuss your findings with your classmates and teacher.

Shallice and Warrington in the year 1970 had cited the case of a man known as KF who met with an accident and damaged a portion of the left side of his cerebral hemisphere. Subsequently, it was found that his long-term memory was intact but the short-term memory was seriously affected. The stage model suggests that information are committed to the long-term memory via STM and if KF's STM was affected, how can his long-term memory be normal? Several other studies have also shown that memory processes are similar irrespective of whether any information is retained for a few seconds or for many years and that memory can be adequately understood without positing separate memory stores. All these evidences led to the development of another conceptualisation about memory which is discussed below as the second model of memory.

Levels of Processing

The levels of processing view was proposed by Craik and Lockhart in 1972. This view suggests that the processing of any new information relates to the manner in which it is perceived, analysed, and understood which in turn determines the extent to which it will eventually be retained. Although this view has undergone many revisions since then, yet its basic idea remains the same. Let us examine this view in greater detail.

Craik and Lockhart proposed that it is possible to analyse the incoming information at more than one level. One may analyse it in terms of its physical or structural features. For example, one might attend only to the shape of letters in a word say *cat* - inspite of whether the word is written in capital or small letters or the colour of the ink in which it is written. This is the first and the shallowest level of processing. At an intermediate level one might consider and attend to the phonetic sounds that are attached to the letters and therefore the structural features are transformed into at least one meaningful word say, a word *cat* that has three specific letters. Analysing information at these two levels produces memory that is fragile and is likely to decay rather quickly. However, there is a third and the deepest level at which information can be processed. In order to ensure that the information is retained for a longer period, it is important that it gets analysed and understood in terms of its meaning. For instance, you may think of cat as an animal that has furs, has four legs, a tail, and is a mammal. You can also invoke an image of a cat and connect that image with your experiences. To sum up, analysing information in terms of its structural and phonetic features amounts to shallower processing while encoding it in terms of the meaning it carries (the semantic encoding) is the deepest processing level that leads to memory that resists forgetting considerably.

Understanding memory as an outcome of the manner in which information is encoded initially has an important implication for learning. This view of memory will help you realise that while you are learning a new lesson, you must focus on elaborating the meaning of its contents in as much detail as possible and must not depend on rote memorisation. Attempt this and you will soon realise that understanding the meaning of information and reflecting on how it relates to other facts, concepts, and your life experiences is a sure way to long-term retention.

Types of Long-term Memory

As you have read in Box 7.1, the short-term memory is now seen as consisting of more than one component (working memory). In the same way it is suggested that long-term memory too is not unitary because it contains a wide variety of information. In view of this, contemporary formulations envisage long-term memory as consisting of various types. For instance, one major classification within the LTM is that of **Declarative** and **Procedural** (sometimes called nondeclarative) memories. All information pertaining to facts, names, dates, such as a rickshaw has three wheels or that India became independent on August 15

1947 or a frog is an amphibian or you and your friend share the same name, are part of declarative memory. Procedural memory, on the other hand, refers to memories relating to procedures for accomplishing various tasks and skills such as how to ride a bicycle, how to make tea or play basketball. Facts retained in the declarative memory are amenable to verbal descriptions while contents of procedural memory cannot be described easily. For example, when asked you can describe how the game of cricket is played but if someone asks you how do you ride a bicycle, you may find it difficult to narrate.

Tulving has proposed yet another classification and has suggested that the declarative memory can either be **Episodic** or **Semantic**.

Episodic memory contains biographical details of our lives. Memories relating to our personal life experiences constitute the episodic memory and it is for this reason that its contents are generally emotional in nature. How did you feel when you stood first in your class? Or how angry was your friend and what did s/he say when you did not fulfil a promise? If such incidents did actually happen in your life, you perhaps will be able to answer these questions with reasonable accuracy. Although such experiences are hard to forget, yet it is equally true that many events take place continuously in our lives and that we do not remember all of them. Besides, there are painful and unpleasant experiences which are not remembered in as much detail as pleasant life experiences.

Box 7.2 Long-term Memory Classification

The study of memory is a fascinating field and researchers have reported many new phenomena. The following phenomena show the complex and dynamic nature of human memory.

***Flashbulb Memories** : These are memories of events that are very arousing or surprising. Such memories are very detailed. They are like a photo taken with an advanced model camera. You can push the button, and after one minute you have a recreation of the scene. You can look at the photograph whenever you want. Flashbulb memories are like images frozen in memory and tied to particular places, dates, and times. Perhaps, people put in greater effort in the formation of these memories, and highlighting details might lead to deeper levels of processing as well as offer more cues for retrieval.*

***Autobiographical Memory** : These are personal memories. They are not distributed evenly throughout our lives. Some periods in our lives produce more memories than others. For instance, no memories are reported pertaining to early childhood particularly during the first 4 to 5 years. This is called **childhood amnesia**. There is a dramatic increase in the frequency of memories just after early adulthood, i.e. in the twenties. Perhaps emotionality, novelty, and importance of events contribute to it. During old age, the most recent years of life are likely to be well remembered. However, before this, around 30 years of age, decline in certain kinds of memory starts.*

***Implicit Memory** : Recent studies have indicated that many of the memories remain outside the conscious awareness of a person. Implicit memory is a kind of memory that a person is not aware of. It is a memory that is retrieved automatically. One interesting example of implicit memory comes from the experience of typing. If someone knows typing that means s/he also knows the particular letters on the keyboard. But many typists cannot correctly label blank keys in a drawing of a keyboard. Implicit memories lie outside the boundaries of awareness. In other words, we are not conscious of the fact that a memory or record of a given experience exists. Nevertheless, implicit memories do influence our behaviour. This kind of memory was found in patients suffering from brain injuries. They were presented a list of common words. A few minutes later the patient was asked to recall words from the list. No memory was shown for the words. However, if s/he was prompted to say a word that begins with these letters and two letters are given, the patient was able to recall words. Implicit memories are also observed in people with normal memories.*

Semantic memory, on the other hand, is the memory of general awareness and knowledge. All concepts, ideas and rules of logic are stored in semantic memory. For instance, it is because of semantic memory that we remember the meaning of say 'non-violence' or remember that 2+6=8 or the STD code of New Delhi is 011 or that the word *'elaphant'* is misspelt. Unlike episodic memory this kind of memory is not dated; you perhaps will not be able to tell when you learnt the meaning of non-violence or on which date you came to know that Bangalore is the capital of Karnataka. Since the contents of semantic memory relate to facts and ideas of general awareness and knowledge, it is affect-neutral and not susceptible to forgetting. See Box 7.2 for various other classifications of long-term memory.

Activity 7.2

1. *Think about your early school days. Write down two separate events that occurred during those days, and which you remember vividly. Use separate sheets for writing about each event.*
2. *Think of the first month in Class XI. Write down two separate events that occurred during the month, and which you remember vividly. Use separate sheets for each event.*

Compare these in terms of length, felt emotions, and coherence.

Activity 7.3

Write the sentences given below on separate cards. Invite some junior students to play this game with you. Seat her/him across a table in front of you. Tell her/him "In this game you will be shown some cards one by one at a steady pace, you have to read the question written on each card and answer it in yes or no".

Note down the answers.

1.	*Is the word written in capital letters?*	*BELT*
2.	*Does the word rhyme with the word crew?*	*grew*
3.	*Does the word fit in the following sentence? "_____ study in school".*	*Students*
4.	*Does the word rhyme with the word gold?*	*mood*
5.	*Is the word written in capital letters?*	*bread*
6.	*Does the word fit in the following sentence? "The son of my uncle is my _____."*	*cousin*
7.	*Does the word fit in the following sentence? My _____ is a vegetable.*	*home*
8.	*Does the word fit in the following sentence? "_____ is a piece of furniture".*	*Potato*
9.	*Is the word written in capital letters?*	*TABLE*
10.	*Does the word rhyme with the word wears?*	*bears*
11.	*Is the word written in capital letters?*	*marks*
12.	*Does the word rhyme with the word clear?*	*five*
13.	*Does the word fit in the following sentence? "Children like to play _____ ."*	*games*
14.	*Does the word fit in the following sentence? "People usually meet _____ in the bucket."*	*friends*
15.	*Does the word fit in the following sentence? "My class room is filled with _____."*	*shirts*
16.	*Does the word fit in the following sentence? "My mother gives me enough pocket _____."*	*money*

After completing the task of reading the cards, ask the students to recall the words about which the questions were asked. Note down the words recalled. Count the number of words recalled in the structural, phonological, and semantic types of processing required by the question.

Discuss results with your teacher.

Box 7.3 Methods of Memory Measurement

There are many ways in which memory is measured experimentally. Since there are many kinds of memories, any method appropriate for studying one type of memory may not be suited for studying another. The major methods which are used for memory measurement are being presented here :

a) Free Recall and Recognition (for measuring facts/episodes related memory) : In free recall method, participants are presented with some words which they are asked to memorise and after some time they are asked to recall them in any order. The more they are able to recall, the better their memory is. In recognition, instead of being asked to generate items, participants see the items that they had memorised along with distracter items (those that they had not seen) and their task is to recognise which one of those they had learnt. The greater the number of recognition of 'old items', better is the memory.

b) Sentence Verification Task (for measuring semantic memory) : As you have already read, semantic memory is not amenable to any forgetting because it embodies general knowledge that we all possess. In sentence verification task, the participants are asked to indicate whether the given sentences are true or false. Faster the participants respond, better retained is the information needed to verify those sentences (see Activity 7.3 for use of this task in measurement of semantic knowledge).

c) Priming (for measuring information we cannot report verbally) : We store many kinds of information that we can't report verbally - for instance, information necessary to ride a bicycle or play a sitar. Besides, we also store information that we are not aware of, which is described as implicit memory. In priming method, participants are shown a list of words, such as garden, playground, house, etc. and then they are shown parts of these words like gar, pla, ho, along with parts of other words they had not seen. Participants complete parts of seen words more quickly than parts of words they had not seen. When asked, they are often unaware of this and report that they have only guessed.

Knowledge Representation and Organisation in Memory

In this section we will take a look at the organisational structure that the contents of long-term memory acquire over a period of time. Since long-term memory holds a very large amount of information which is put to use with amazing efficiency, it would be very useful to know how our memory system organises its contents so that the right information is available at the right moment. It is important to note at this point that many ideas relating to organisation of the content of long-term memory have resulted from experiments that have employed semantic retrieval tasks. You will perhaps agree that there cannot be any error in recalling the contents of semantic memory. For anyone who knows that birds fly will not make a mistake in answering a question — Do birds fly? The answer will be in affirmative. But people may take variable lengths of time in answering questions, which require semantic judgments. While responding to question 'Do birds fly?' a person will take not more than a second but answering a question 'Are birds animals'? may take longer. Depending upon how much time people take in responding to questions such as these, the nature of organisation in long-term memory has been inferred.

The most important unit of representation of knowledge in long-term memory is a concept. **Concepts** are mental categories for objects and events, which are similar to each other in one or in more than one way.

Concepts once formed get organised in categories — a category itself is a concept but it also functions to organise similarities among other concepts based on common features. For example, the word mango is a category because different varieties of mangoes can be subsumed within it and it is also a concept within the category of fruit. Concepts may also

get organised in **schema**. They are mental frameworks which represent our knowledge and assumptions about the world. For example, think of a schema of a drawing room. It will have different objects/things, like a sofa set, center table, paintings, etc., which are found in a drawing room and where they are found in the drawing room.

So far we have examined the concept as the basic level at which knowledge is represented in the long-term memory and the notions of category and schema as the first level at which concepts are organised. Let us now look at a higher level of organisation that concepts acquire in the long-term memory.

In the year 1969, Allan Collins and Ross Quillian published a landmark research paper in which they suggested that knowledge in long-term memory is organised hierarchically and assumes a network structure. Elements of this structure are called *nodes.* Nodes are concepts while connections between nodes are *labelled relationships*, which indicate category membership or concept attributes.

In order to verify the proposed network structure of long-term knowledge, participants of experiments were asked to verify the truth of the statements such as 'canary is a bird' or 'a canary is an animal' (answer was in Yes/No). These were generally class-inclusion statements in which the subject was word 'canary' (perhaps, you know, it is a bird) and the predicate took the form 'is a'. A critical finding of such experiments was that as the predicate became hierarchically more remote from the subject in a sentence, participants took longer time to verify that it is true or false. Thus, people took longer to verify that a 'canary is an animal' compared to that which said 'canary is a bird' because bird is an immediate superordinate category in which canary is subsumed while animal is a superordinate category which is more distant and remote from the concept canary. According to this view, we can store all knowledge at a certain level that 'applies to all the members of a category without having to repeat that information at the lower levels in the hierarchy'. This ensures a high degree of **cognitive economy**, which means maximum and efficient use of the capacity of long-term memory with minimum redundancy.

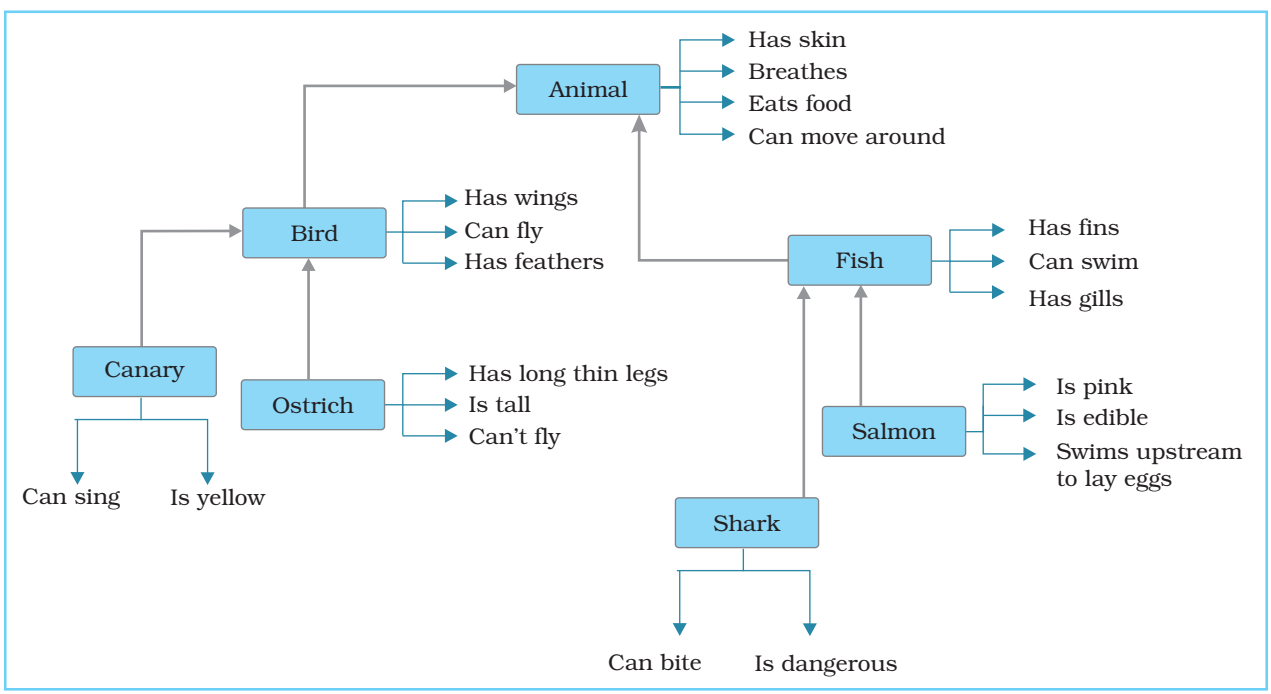

Fig.7.2 : The Hierarchical Network Model

So far we have discussed concept as unit of representation of knowledge in the long-term memory and looked at various ways in which concepts get organised. Does this mean that knowledge is encoded only in word-like format or can there be other ways of encoding? It has been shown that information can be coded in a perceptual format or in terms of images. An image is a concrete form of representation which directly conveys the perceptual attributes of an object. If you were to come across the word 'school', an image of your own school will get generated. In fact, almost all concrete objects (and concepts) generate images and the knowledge related to them is encoded both verbally as well as visually. This is known as **dual coding hypothesis**, originally proposed by Paivio. According to this hypothesis, concrete nouns and information related to concrete objects are encoded and stored in the form of images while information related to abstract concepts assume a verbal and a descriptive code. For example, if you are asked to describe a bird, the first thing that happens is that an image of a bird is generated and based on this image, you describe a bird. But, on the other hand, the meanings of concepts like 'truth' or 'honesty' will not have such accompanying images. So, any information which has been encoded verbally as well as in the form of images is recalled with greater ease.

Box 7.4 Memory Making : Eyewitness and False Memories

Eyewitness Memory

Court procedures followed in criminal trials, use the testimony given by the eyewitness of the offense. It is considered to be the most reliable evidence for or against the accused. Some experiments carried out by Loftus and her colleagues during the mid-seventies showed that the eyewitness's memory is susceptible to many flaws.

The experimental procedure followed by Loftus was very simple. A film clipping of an event (usually a car accident) was shown to the participants. This was followed by some questions, which interferes with encoding of the event. One of the questions was "how fast were the cars going when they smashed into each other". In another question the verb smashed *was replaced with the verb* contacted. *Those who were asked the first question (which included the word* 'smashed') *estimated the speed of the cars as 40.8 mph. Those who were given the second question (i.e. with the word* 'contacted') *estimated that the speed of the cars was only 31.8 mph. Clearly, the nature of leading questions changed the memory. In fact, the encoding of the event was 'overwritten' by misleading questions. Some of these errors are also committed because of affective nature of the event itself. For example, events depicting violence or a tragedy tend to arouse strong emotions, the eyewitnesses get overwhelmed and do not pay attention to details while encoding.*

False Memory

An interesting phenomenon called false memory can be induced by powerful imagination of events that did not take place at all. Surprised? Let us look at one such study carried out by Garry, Manning and Loftus in 1996 and understand the features of false memory.

Initially they presented before the participants of their experiments, a list of events that could have occurred in their lives. In the first phase of this experiment, they rated the likelihood that each of these events actually took place in their lives to the best of their childhood memories. Two weeks later, they were invited again to the laboratory and were asked to imagine those events and visualise as if they actually happened to them. In particular, events which were rated low in terms of their likelihood of occurrence, were chosen for the task of visualising and imagining. This was the second phase of the experiment. Finally, in the third phase, the experimenters pretended that they had misplaced the event likelihood ratings which they had obtained during the first phase and therefore requested the participants to respond to the list, once again. Interestingly, events which were rated low on likelihood in the first phase but were later visualised and imagined as real were now rated high. The participants reported that those events actually took place in their lives. These findings suggest that memory can be induced and implanted through imagination inflation — a finding that provides useful insights into memory processes.

Information which has been encoded and stored in the form of images leads to the development of *mental models.* There are many routine tasks which require mental models. For example, following a road direction, assembling a bicycle or even preparing to cook an exotic dish from instructions given in a cookery book require that spatial mental models are created from verbal descriptions. Mental models, therefore, refer to our belief about the manner in which our environment is structured and such beliefs are formed with the help of concrete images as well as verbal descriptions.

Memory as a Constructive Process

If you were to carefully examine the initial explorations about memory processes, you will perhaps conclude that memory primarily consists of reproduction of stored materials. This view was held by Ebbinghaus and his followers who emphasised the quantity of information that can be stored in the memory and judged its accuracy by matching the contents of storage and reproduction. If the reproduced version of the stored material showed any deviation, it was seen as an error and a case of memory failure. This storage metaphor of memory implied that the memory was a passive occurrence of learnt material that has been transported to its long-term storehouse. This position was challenged by Bartlett in the early thirties who contended that memory is an active process and all that we have stored undergoes continuous change and modification. What we memorise is influenced by the meaning we assign to the stimulus material and once it is committed to our memory system, it cannot remain in isolation from other cognitive processes.

In essence, therefore, Bartlett saw memory as a constructive and not a reproductive process. Using meaningful materials such as texts, folk tales, fables, etc. Bartlett attempted to understand the manner in which content of any specific memory gets affected by a person's knowledge, goals, motivation, preferences and various other psychological processes. He conducted simple experiments in which reading of such stimulus materials was followed by fifteen minutes break and then the participants of his experiment recalled what they had read. Bartlett used the method of **serial reproduction** in which the participants of his experiments recalled the memory materials repeatedly at varying time intervals. While engaging in serial reproduction of learned material his participants committed a wide variety of 'errors' which Bartlett considered useful in understanding the process of memory construction. His participants altered the texts to make them more consistent with their knowledge, glossed over the unnecessary details, elaborated the main theme and transformed the material to look more coherent and rational.

In order to explain such findings, Bartlett invoked the term **schema**, which according to him 'was an active organisation of past reactions and past experiences'. Schemas refer to an organisation of past experiences and knowledge, which influence the way in which incoming information is interpreted, stored, and later retrieved. Memory, therefore, becomes an active process of construction where information is encoded and stored in terms of a person's understanding and within her/his previous knowledge and expectations.

Nature and Causes of Forgetting

Each one of us has experienced forgetting and its consequences almost routinely. Why do we forget? Is it because the information we commit to our long-term memory is somehow lost? Is it because we did not memorise it well enough? Is it because we did not encode the information correctly or is it because during storage, it got distorted or misplaced? Many theories have been forwarded to explain forgetting and now you will read about those that seem plausible and have received considerable attention.

The first systematic attempt to understand the nature of forgetting was made by Hermann Ebbinghaus, who memorised lists of nonsense syllables (CVC trigrams such as NOK or SEP

etc.) and then measured the number of trials he took to relearn the same list at varying time intervals. He observed that the course of forgetting follows a certain pattern which you can see in Figure 7.3.

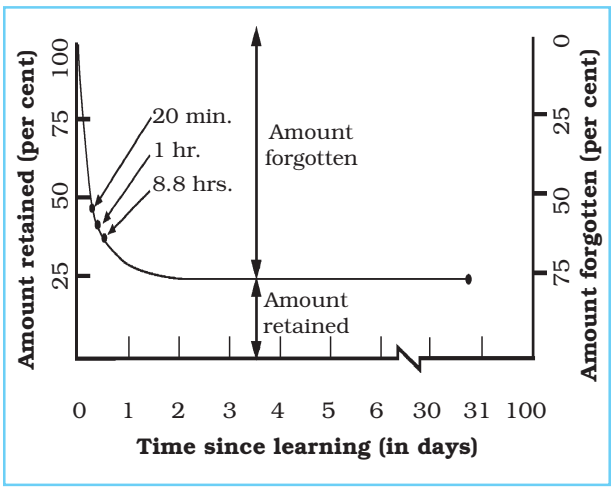

Fig.7.3 : Ebbinghaus's Curve of Forgetting

As the figure indicates, the rate of forgetting is maximum in the first nine hours, particularly during the first hour. After that the rate slows down and not much is forgotten even after many days. Although Ebbinghaus's experiments constituted initial explorations and were not very sophisticated yet they have influenced memory research in many important ways. It is now upheld, almost unanimously, that there is always a sharp drop in memory and thereafter the decline is very gradual. Let us now examine the main theories, which have been advanced to explain forgetting.

Forgetting due to Trace Decay

Trace decay (also called disuse theory) is the earliest theory of forgetting. The assumption here is that memory leads to modification in the central nervous system, which is akin to physical changes in the brain called *memory traces*. When these memory traces are not used for a long time, they simply fade away and become unavailable. This theory has been proved inadequate on several grounds. If forgetting takes place because memory traces decay due to disuse, then people who go to sleep after memorising should forget more compared to those who remain awake, simply because there is no way in which memory traces can be put to use during sleep. Results, however, show just the opposite. Those who remain awake after memorising (waking condition) show greater forgetting than those who sleep (sleeping condition).

Because trace decay theory did not explain forgetting adequately, it was soon replaced by another theory of forgetting which suggested that new information that enters the long-term memory interferes with the recall of earlier memories and therefore, interference is the main cause of forgetting.

Forgetting due to Interference

If forgetting is not due to trace decay then why does it take place? A theory of forgetting that has perhaps been the most influential one is the interference theory which suggests that forgetting is due to interference between various information that the memory store contains. This theory assumes that learning and memorising involve forming of associations between items and once acquired, these associations remain intact in the memory. People keep acquiring numerous such associations and each of these rests independently without any mutual conflict. However, interference comes about at a time of retrieval when these various sets of associations compete with each other for retrieval. This interference process will become clearer with a simple exercise. Request your friend to learn two separate lists of nonsense syllables (list A and list B) one after the other and after a while ask her/him to recall the nonsense syllables of list A. If while trying to recall the items of list A, s/he recalls some of the items of list B, it is because of the association formed while learning list B are interfering with the earlier association which were formed while learning list A.

There are atleast two kinds of interferences that may result in forgetting. Interference can be *proactive* (forward moving) which means what you have learnt earlier interferes with

Table 7.1 Experimental Designs for Retroactive and Proactive Interference

Retroactive Interference	*Phase 1*	*Phase 2*	*Testing Phase*
Experimental participant/group	Learns A	Learns B	Recalls A
Control participant/group	Learns A	Rests	Recalls A
Proactive Interference			
Experimental participant/group	Learns A	Learns B	Recalls B
Control participant/group	Rests	Learns B	Recalls B

the recall of your subsequent learning or *retroactive* (backward moving) which refers to difficulty in recalling what you have learnt earlier because of learning a new material. In other words, in proactive interference, past learning interferes with the recall of later learning while in retroactive interference the later learning interferes with the recall of past learning. For example, if you know English and you find it difficult to learn French, it is because of proactive interference and if, on the other hand, you cannot recall English equivalents of French words that you are currently memorising, then it is an example of retroactive interference. A typical experimental design that is used to demonstrate proactive and retroactive interference has been presented in Table 7.1.

Forgetting due to Retrieval Failure

Forgetting can occur not only because the memory traces have decayed over time (as suggested by the disuse theory) or because independent sets of stored associations compete at the time of recall (as suggested by the interference theory) but also because at the time of recall, either the retrieval cues are absent or they are inappropriate. Retrieval cues are aids which help us in recovering information stored in the memory. This view was advanced by Tulving and his associates who carried out several experiments to show that contents of memory may become inaccessible either due to absence or inappropriateness of retrieval cues that are available/employed at the time of recall.

Box 7.5 Repressed Memories

Some individuals undergo experiences that are traumatic. A traumatic experience emotionally hurts a person. Sigmund Freud posited that such experiences are repressed into the unconscious and are not available for retrieval from memory. It is a kind of repression — painful, threatening, and embarrassing memories are held out of consciousness.

In some persons, traumatic experiences may give rise to psychological amnesia. Some individuals experience crisis, and are utterly incapable of coping with such events. They close their eyes, ears and mind to such harsh realities of life, and take mental flight from them. It results in highly generalised amnesia. One of the results of such flights is the emergence of a disorder known as 'fugue state'. Persons who become victims of such a state assume a new identity, name, address, etc. They have two personalities and one knows nothing about the other.

Forgetfulness or loss of memory under stress and high anxiety is not uncommon. Many hard working and ambitious students aspire for high scores in final examinations and to achieve such ends they put in long hours in studies. But when they receive the question paper, they become extremely nervous and forget everything they had prepared well.

Activity 7.4

Given below are two lists of words. First memorise the list in such a way that you are able to recall the words without any error. Now you take up the second list and memorise it to the criterion of correct recall error. Forget about the list and read something else for an hour. Now recall the words in the first list and write them down. Note the total number of words correctly recalled and the number of words incorrectly recalled.

List 1

Goat	*Sheep*	*Leopard*
Jackal	*Monkey*	*Camel*
Mule	*Deer*	*Squirrel*
Horse	*Cheetah*	*Wolf*
Snake	*Rabbit*	*Parrot*

List 2

Pig	*Elephant*	*Donkey*
Pigeon	*Cobra*	*Tiger*
Mynah	*Lion*	*Calf*
Bears	*Fox*	*Crow*
Buffalo	*Mouse*	

Get the cooperation of one of your friends and request her/him to memorise the words of List 1 to the criterion as stated above. Request her/him to sing a song and have a cup of tea with you. Keep her/him engaged in some conversation for an hour or so. Then request her/him to write down the words s/he had memorised earlier.

Compare your recall with the one made by your friend.

Let us understand this with the help of an example. Suppose you have memorised a list of meaningful words like hut, wasp, cottage, gold, bronze, ant, etc. in which words belonged to six categories (like places of living, names of insects, types of metal, etc.). If after a while you are asked to recall those you may recall a couple of them but if during the second recall attempt, you are also provided with category names, then you may find that your recall is near total. Category names in this example act as retrieval cues. Besides category names, the physical context in which you learn also provides effective retrieval cues.

Enhancing Memory

All of us desire to possess an excellent memory system that is robust and dependable. Who, after all, likes to face situations of memory failures that lead to so much of anxiety and embarrassment? After learning about various memory related processes, you certainly would like to know how your memory can be improved. There are a number of strategies for improving memory called **mnemonics** (pronounced ni-mo-nicks) to help you improve your memory. Some of these mnemonics involve use of images whereas others emphasise self-induced organisation of learned information. You will now read about mnemonics and some suggestions given for memory improvement.

Mnemonics using Images

Mnemonics using images require that you create vivid and interacting images of and around the material you wish to remember. The two prominent mnemonic devices, which make interesting use of images, are the *keyword method* and the *method of loci*.

(a) *The Keyword Method* : Suppose you want to learn words of any foreign language. In keyword method, an English word (the assumption here is that you know English language) that sounds similar to the word of a foreign language is identified. This English

word will function as the keyword. For example, if you want to remember the Spanish word for duck which is *'Pato'*, you may choose 'pot' as the keyword and then evoke images of keyword and the target word (the Spanish word you want to remember) and imagine them as interacting. You might, in this case, imagine a duck in a pot full of water. This method of learning words of a foreign language is much superior compared to any kind of rote memorisation.

(b) *The Method of Loci* : In order to use the method of loci, items you want to remember are placed as objects arranged in a physical space in the form of visual images. This method is particularly helpful in remembering items in a serial order. It requires that you first visualise objects/places that you know well in a specific sequence, imagine the objects you want to remember and associate them one by one to the physical locations. For example, suppose you want to remember bread, eggs, tomatoes, and soap on your way to the market, you may visualise a loaf of bread and eggs placed in your kitchen, tomatoes kept on a table and soap in the bathroom. When you enter the market all you need to do is to take a mental walk along the route from your kitchen to the bathroom recalling all the items of your shopping list in a sequence.

Mnemonics using Organisation

Organisation refers to imposing certain order on the material you want to remember. Mnemonics of this kind are helpful because of the framework you create while organisation makes the retrieval task fairly easy.

(a) *Chunking* : While describing the features of short-term memory, we noted how chunking can increase the capacity of short-term memory. In chunking, several smaller units are combined to form large chunks. For creating chunks, it is important to discover some organisation principles, which can link smaller units. Therefore, apart from being a control mechanism to increase the capacity of short-term memory, chunking can be used to improve memory as well.

(b) *First Letter Technique* : In order to employ the first letter technique, you need to pick up the first letter of each word you want to remember and arrange them to form another word or a sentence. For example, colours of a rainbow are remembered in this way (VIBGYOR- that stands for Violet, Indigo, Blue, Green, Yellow, Orange and Red).

Mnemonic strategies for memory enhancement are too simplistic and perhaps underestimate complexities of memory tasks and difficulties people experience while memorising. In place of mnemonics, a more comprehensive approach to memory improvement has been suggested by many psychologists. In such an approach, emphasis is laid on applying knowledge about memory processes to the task of memory improvement. Let us examine some of these suggestions.

It is suggested that one must :

(a) *Engage in Deep Level Processing* : If you want to memorise any information well, engage in deep level processing. Craik and Lockhart have demonstrated that processing information in terms of meaning that they convey leads to better memory as compared to attending to their surface features. Deep processing would involve asking as many questions related to the information as possible, considering its meaning and examining its relationships to the facts you already know. In this way, the new information will become a part of your existing knowledge framework and the chances that it will be remembered are increased.

(b) *Minimise Interference* : Interference, as we have read, is a major cause of forgetting and therefore you should try to avoid it as much as possible. You know that maximum interference is caused when very similar materials are learned in a sequence. Avoid this. Arrange your study in such a way that you do not learn similar subjects one after the other. Instead, pick up some other subject unrelated to the previous one. If that is not possible, distribute your learning/practice. This means giving yourself intermittent rest periods while studying to minimise interference.

(c) *Give Yourself enough Retrieval Cues* : While you learn something, think of retrieval cues inherent in your study material. Identify them and link parts of the study material to these cues. Cues will be easier to remember compared to the entire content and the links you have created between cues and the content will facilitate the retrieval process.

Thomas and Robinson have developed another strategy to help students in remembering more which they called the methods of PQRST. This acronym stands for Preview, Question, Read, Self-recitation, and Test. Preview refers to giving a cursory look at the chapter and familiarising oneself with its contents. Question means raising questions and seeking answers from the lesson. Now start reading and look for answers of questions you had raised. After reading try to rewrite what you have read and at the end test how much you have been able to understand.

At the end, a note of caution must be sounded. There is no one method that can solve all problems related to retention and bring about an overnight memory improvement. In order to improve your memory, you need to attend to a wide variety of factors which affect your memory such as your health status, your interest and motivation, your familiarity with the subject matter and so on. In addition, you must learn to use strategies for memory improvement depending upon the nature of memory tasks you are required to accomplish.

Key Terms

Chunking, Cognitive economy, Concepts, Control process, Dual coding, Echoic memory, Encoding, Episodic memory, Elaborative rehearsals, Fugue state, Information processing approach, Maintenance rehearsals, Memory making, Mnemonics, Schema, Semantic memory, Serial reproduction, Working memory

Summary

- *Memory is seen as consisting of three interrelated processes of encoding, storage and retrieval.*
- *While encoding is registering the incoming information in a way that it becomes compatible to the memory system, storage and retrieval refers to holding the information over a period of time and bringing the information back to one's awareness, respectively.*
- *The Stage Model of Memory compares memory processes with the working of a computer and suggests that incoming information is processed through three distinct stages of sensory memory, short-term memory and long-term memory.*
- *Levels of processing view of memory contends that the information can be encoded at any of the three levels, namely, the structural, the phonetic and the semantic. If an information is analysed and encoded semantically, which is the deepest level of processing, then it leads to better retention.*
- *Long-term memory has been classified in many ways. One major classification is that of declarative and procedural memory and another is that of episodic and semantic memory.*
- *Contents of long-term memory get represented in terms of concepts, categories and images and are organised hierarchically.*
- *Forgetting refers to loss of stored information over a period of time. After a material is learnt, there is a sharp drop in its memory and then the decline is very gradual.*
- *Forgetting has been explained as resulting from trace decay and interference. It may also be caused due to absence of appropriate cues at the time of retrieval.*
- *Memory is not only a reproductive but also a constructive process. What we store undergoes change and modification within one's past knowledge and schema.*
- *Mnemonics are strategies for improving memory. While some mnemonics use images, other emphasise organisation of the learnt material.*

Review Questions

1. What is the meaning of the terms 'encoding', 'storage' and 'retrieval'?
2. How is information processed through sensory, short-term and long-term memory systems?
3. How are maintenance rehearsals different from elaborative rehearsals?
4. Differenciate between declarative and procedural memories?
5. Describe the hierarchical organisation in long-term memory?
6. Why does forgetting take place?
7. How is retrieval related forgetting different from forgetting due to interference?
8. What evidence do we have to say that 'memory is a constructive process'?
9. Define mnemonics? Suggest a plan to improve your own memory.

Project Ideas

1. Recall and write down an event of your life that you remember very clearly. Also request others (those who were participants of that event such as your brother/sister, parents or other relatives/friends) to do the same. Compare the two recalled versions and look for discrepancies and similarities. Try to reason why there are similarities and discrepancies.
2. Narrate a story to your friend and ask her/him to write it down after an hour. Also request her/him to narrate what s/he had written to another person. Continue this process till you have at least 5 versions of the original story. Compare the various versions and identify constructive processes in memory.

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Chapter 8

Thinking

After reading this chapter, you would be able to

- describe the nature of thinking and reasoning,
- demonstrate an understanding of some cognitive processes involved in problem solving and decision-making,
- understand the nature and process of creative thinking and learn ways of enhancing it,
- understand the relationship between language and thought, and
- describe the process of language development and its use.

But whatever the process, the result is wonderful, gradually from naming an object we advance step-by-step until we have traversed the vast difference between our first stammered syllable and the sweep of thought in a line of Shakespeare.

– Helen Keller

Contents

Introduction
Nature of Thinking
Building Blocks of Thought
Culture and Thinking (Box 8.1)
The Processes of Thinking
Problem Solving
Reasoning
Decision-making
Nature and Process of Creative Thinking
Nature of Creative Thinking
Lateral Thinking (Box 8.2)
Process of Creative Thinking
Developing Creative Thinking
Barriers to Creative Thinking
Strategies for Creative Thinking
Thought and Language
Development of Language and Language Use
Bilingualism and Multilingualism (Box 8.3)

Key Terms
Summary
Review Questions
Project Ideas

Introduction

Think for a moment: how many times and in what ways you are using the word 'think' in your day-to-day conversations. Sometimes probably, you use it as a synonym to remember (I can't think of her name), pay attention (think about it) or convey uncertainty (I think today my friend will visit me). 'Think' has a wide range of meanings which cover a number of psychological processes. However, in psychology, thinking is a core subject area with an independent existence and a meaning of its own. In this chapter, we will discuss thinking as a mental activity directed at solving a problem, making inferences, judging certain facts, and deciding and choosing between options. Further, the nature and characteristics of creative thinking, what it involves and how it can be developed will also be discussed. Have you ever seen a small child building a tower with blocks or sand? The child would build a tower, dismantle it, make another one and so on and so forth. While doing this, the child sometimes talks to herself or himself. The speech would primarily include the steps s/he is following or want to follow ("not this", "a little small", "a tree at the back"), evaluation of the design ("nice"). You also might have experienced talking to yourself while solving a problem. Why do we talk while we think? What is the relationship between language and thought? In this chapter, we shall also be discussing the development of language and the relationship between language and thought. Before starting our discussion on thinking, it is necessary to discuss thinking as the base of human cognition.

Nature of Thinking

Thinking is the base of all cognitive activities or processes and is unique to human beings. It involves manipulation and analysis of information received from the environment. For example, while seeing a painting, you are not simply focusing on the colour of the painting or the lines and strokes, rather you are going beyond the given text in interpreting its meaning and you are trying to relate the information to your existing knowledge. Understanding of the painting involves creation of new meaning that is added to your knowledge. Thinking, therefore, is a higher mental process through which we manipulate and analyse the acquired or existing information. Such manipulation and analysis occur by means of abstracting, reasoning, imagining, problem solving, judging, and decision-making.

Thinking is mostly organised and goal directed. All day-to-day activities, ranging from cooking to solving a math problem have a goal. One desires to reach the goal by planning, recalling the steps that one has already followed in the past if the task is familiar or inferring strategies if the task is new.

Thinking is an internal mental process, which can be inferred from overt behaviour. If you see a chess player engrossed in thinking for several minutes before making a move, you cannot observe what he is thinking. You can simply infer what he was thinking or what strategies he was trying to evaluate, from his next move.

Building Blocks of Thought

We already know that thinking relies on knowledge we already possess. Such knowledge is represented either in the form of mental images or words. People usually

think by means of mental images or words. Suppose you are travelling by road to reach a place, which you had visited long back. You would try to use the visual representation of the street and other places. On the other hand, when you want to buy a storybook your choice would depend upon your knowledge about different authors, themes, etc. Here, your thinking is based on words or concepts. We shall first discuss mental image and then move on to concepts as the base of human thought.

Mental Image

Suppose, I ask you to imagine a cat sitting on a tree with its tail slightly raised and curved. You would most likely try to form a visual image of the whole situation, something similar to what the girl in the picture is doing (Fig.8.1). Or think of another

Fig.8.1 : The Girl forming a Mental Image

situation where you are asked to imagine yourself standing in front of the Taj Mahal and describe what you see. While doing this you are actually forming a visual image of the event. You are probably trying to see through your mind's eye, just like the way you would see a picture. Why is it useful to draw a map while giving directions to someone? Try to remember your earlier experience in reading a map, remembering the different places and subsequently locating them in a physical map in your examination. In doing this, you were mostly forming and using mental images. An **image** is a **mental representation** of a sensory experience; it can be used to think about things, places, and events. You can try out Activity 8.1, which demonstrates how images are formed.

Activity 8.1

Give a map, like the following in Fig.8.2a, to your friend to observe for 2 minutes and tell her/him that later on s/he will be asked to locate the marked places in a blank map. Then present a map, like the one in Fig.8.2b, with no indications of the different places. Ask your friend to locate the places s/he has seen in the first map. Then ask how s/he was able to locate the places. S/he will probably be able to tell you the way s/he formed an image of the whole situation.

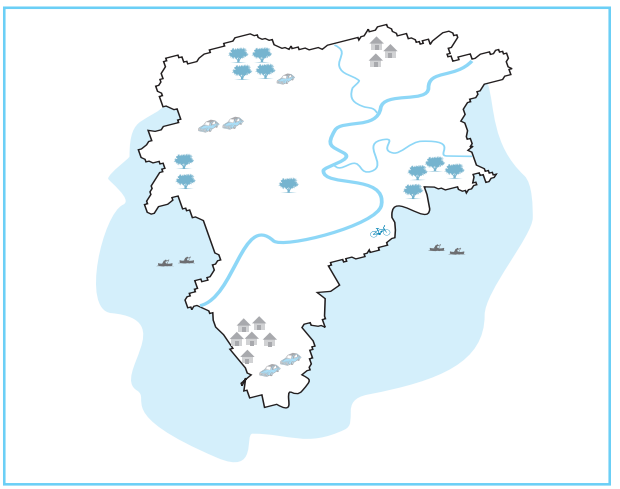


Fig.8.2a : A Map Showing Places

Concepts

How do you know that a lion is not a bird but a parrot is? You have already read this in Chapter 7. Whenever we come across an object or event familiar or unfamiliar, we try to identify the object or event by extracting its characteristics, matching it with the already existing category of objects and events. For example, when we see an apple, we categorise

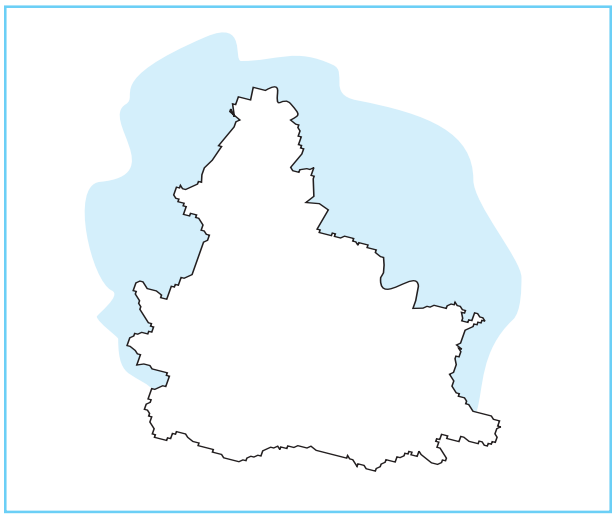


Fig.8.2b : A Blank Map Up Side Down

it as fruit, when we see a table we categorise it as furniture, when we see a dog we categorise it as an animal, and so on. When we see a new object, we try to look for its characteristics, match them with characteristics of an existing category, and if matching is perfect we give it the name of that category. For example, while walking on the road you come across an unfamiliar quadruped of a very small size, with a face like a dog, wagging its tail and barking at strangers. You would no doubt identify it as a dog and probably think that it is of a new breed, which you have never seen before. You would also conclude that it would bite strangers. A concept thus, is a mental representation of a category. It refers to a class of objects, ideas or events that share common properties.

Why do we need to form concepts? Concept formation helps us in organising our knowledge so that whenever we need to access our knowledge, we can do it with less time and effort. It is something similar to what we do to organise our things at home. Children who are very systematic and organised, put their things such as books, note books, pen, pencil, and other accessories in specific places in their cupboard, so that in the morning, they don't have to struggle to find a particular book or the geometry box. In the library too you have seen books organised as per subject areas and labelled so that you would be able to find them quickly with less effort. Thus, for making our thought process quick and efficient, we form concepts and categorise objects and events. You can find out how children form concepts by doing Activity 8.2.

Activity 8.2

Take a piece of cardboard and cut triangles, circles, and squares of three different sizes each, small, medium and large. Then colour them yellow. Similarly prepare a second set and colour them green and a third set and colour them red. Now you have a set of 27 cards varying in shape, size, and colour. Ask a child of five to six years of age to group the similar cards together.

If you will try the above activity with a group of small children, you will observe that there are a number of ways in which the child would respond. S/he would pile them up into different groups based on:

1. size: all small triangles, squares, and circles together, all medium sized together, and so on.
2. shape: all triangles together, all circles together, and so on
3. colour: all reds together, all yellows together, and so on
4. both size and shape: all small triangles together, all medium triangles together, and so on.
5. size, shape and colour: all small circles of red colour together, all medium circles of yellow colour together, and so on.

You have already learned about concept learning in Chapter 6, and the use of concepts in Human Memory in Chapter 7. Concepts usually fall into hierarchies or levels of understanding. The levels are classified as superordinate (the highest level), basic (an intermediate level), and subordinate (the lowest level). While speaking we mostly use basic level concepts. When a person says, "I saw a dog" a basic level is used. Such a statement is much more likely to be made than

"I saw a four legged animal that barks and wags its tail" or "an animal". The first (subordinate) is far too specific than is needed for conversation, while the second (superordinate) is far too vague to convey the intended message. Children also learn basic level concepts first and then the other levels.

Most of the concepts people use in thinking are neither clear nor unambiguous. They are fuzzy. They overlap one another and are often poorly defined. For example, under which category would you put a small stool? Would you put it under the category of 'chair' or under the category of 'table'? The answer to these questions is that we construct a model or *prototype*. A prototype is the best representative member of the category. Eleanor Rosch argues that in considering how people think about concepts, prototypes are often involved in real life. In prototype matching, people decide whether an item is a member of a category by comparing it with the most typical item(s) of the category. Therefore, in the above example of the stool, you would try to compare it with a standard study chair (if you consider it as the typical example of a chair) and a small study table (if you consider it as the typical example of a table) and then match the properties of the stool with these two concepts. If it matches with a chair you would put it under the category of "chair" otherwise under the category of "table". Consider another example: the concept 'cup'. Cups : (i) are concrete objects, (ii) are concave, (iii) can hold solids and liquids, (iv) have handles. What about cups we see in the market: with no handle, with a square shape or unusually big in size? In an experiment, the participants were shown the pictures of cups as in Fig.8.3 and W. Labov asked them: which of these would you describe as the prototype for the concept "cup"? Participants mostly chose number 5. Interestingly, some participants call number 4 a bowl and number 9 a vase because they were so different.

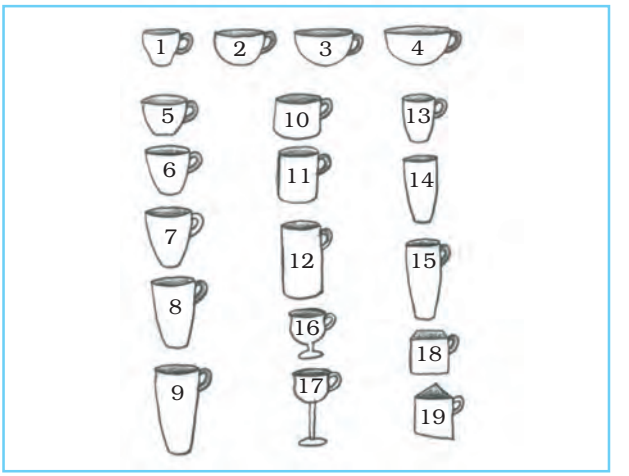
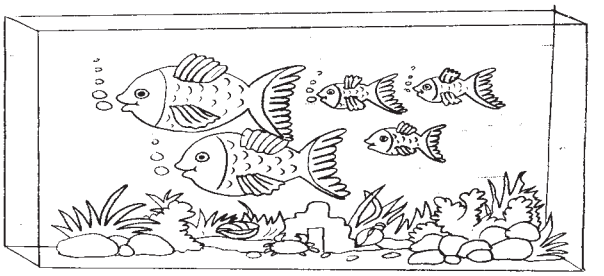


Fig.8.3 : When is a Cup a "Cup"?

Box 8.1 Culture and Thinking

Our beliefs, values, and social practices influence the way we think. In a study conducted on American and Asian students, pictures like the following (underwater scene) were used. The subjects were asked to have a look at the scene for a brief period and then were asked to describe what they saw. The American students focussed on the biggest, brightest, and most outstanding features (for example, "the large fish swimming to the right"). In contrast, the Japanese students focussed on the background (for example, "the bottom was rocky" or "the water was green"). Based on these kinds of findings, researchers concluded that Americans usually analyse each object separately which is called "analytical thinking". Asian people (Japanese, Chinese, Koreans) think more about the relationship between objects and backgrounds, which is called "holistic thinking".



The Processes of Thinking

So far we have been discussing what we mean by thinking and what is the nature of thinking. We also learnt that thinking uses mental images and concepts as the base. Now we will discuss how thinking proceeds in a particular area: problem solving.

Problem Solving

How do we proceed while repairing a broken cycle, or planning a summer tour or patching up a broken friendship? In some cases the solution is reached quickly as in repair of a bicycle based on immediately available cues whereas others are more complex and require time and effort. Problem solving is thinking that is goal-directed. Almost all our day-to-day activities are directed towards a goal. Here it is important to know that problems are not always in the form of obstacles or hurdles that one faces. It could be any simple activity that you perform to reach a defined goal, for example, preparing a quick snack for your friend who has just arrived at your place. In problem solving there is an initial state (i.e. the problem) and there is an end state (the goal). These two anchors are connected by means of several steps or mental operations. Table 8.1 would clarify your understanding of various steps through which one solves a problem.

You can try out the problems given in Activity 8.3 with your friends and observe how they are approaching the problem. You can ask them the steps they follow while solving these problems.

Obstacles to Solving Problems

Two major obstacles to solving a problem are mental set and lack of motivation.

Mental Set

Mental set is a tendency of a person to solve problems by following already tried mental operations or steps. Prior success with a

Table 8.1 Mental Operations Involved in Solving a Problem

Let us look at the problem of organising a play in school on the occasion of Teachers' Day. Problem solving would involve the following sequence.

	Mental operation	*Nature of problem*
1.	*Identify the problem*	*A week is left for teachers' day and you are given the task of organising a play.*
2.	*Represent the problem*	*Organising a play would involve identification of an appropriate theme, screening of actors, actresses, arranging money, etc.*
3.	*Plan the solution: Set sub-goals*	*Search and survey various available themes for a play, and consult teachers and friends who have the expertise. The play to be decided, based on such considerations as cost, duration, suitability for the occasion, etc.*
4.	*Evaluate all solutions (plays)*	*Collect all the information/stage rehearsal.*
5.	*Select one solution and execute it*	*Compare and verify the various options to get the best solution (the play).*
6.	*Evaluate the outcome*	*If the play (solution) is appreciated, think about the steps you have followed for future reference for yourself as well as for your friends.*
7.	*Rethink and redefine problems and solutions*	*After this special occasion you can still think about ways to plan a better play in future.*

Activity 8.3

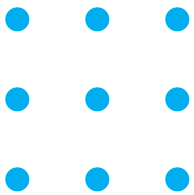
Problem 1

Anagrams : Rearrange the letters to form a word. (You can also construct some similar words)

NAGMARA
BOLMPER
SLEVO
STGNIH
TOLUSONI

Problem 2

Joining dots : Without lifting your pencil from the paper, connect all nine dots by drawing four straight lines.



Problem 3

Try out the 'water in three bottles' activity with your friend.

There are three bottles, A, B, and C. Bottle A can hold 21 ml., B can hold 127 ml., and C can hold 3 ml. The task for your friend is to get 100 ml of water with the help of these three bottles. There are six more problems like this. These seven problems are given below.

Problems	*The required quantity*	*The capacity of the bottles in ml.*		
		A	*B*	*C*
1.	*100*	*21*	*127*	*3*
2.	*99*	*14*	*163*	*25*
3.	*5*	*18*	*43*	*10*
4.	*21*	*9*	*42*	*6*
5.	*31*	*20*	*59*	*4*
6.	*20*	*23*	*49*	*3*
7.	*25*	*28*	*76*	*3*

(Answers are given at the end of the chapter)

particular strategy would sometimes help in solving a new problem. However, this tendency also creates a mental rigidity that obstructs the problem solver to think of any new rules or strategies. Thus, while in some situations mental set can enhance the quality and speed of problem solving, in other situations it hinders problem solving. You might have experienced this while solving mathematical problems. After completing a couple of questions, you form an idea of the steps that are required to solve these questions and subsequently you go on following the same steps, until a point where you fail. At this point you may experience difficulty in avoiding the already used steps. Those steps would interfere in your thought for new strategies. However, in day-to-day activities we often rely on past experiences with similar or related problems.

Like mental set, **functional fixedness** in problem solving occurs when people fail to solve a problem because they are fixed on a thing's usual function. If you have ever used a hardbound book to hammer a nail, then you have overcome functional fixedness.

Lack of Motivation

People might be great at solving problems, but all their skills and talents are of no use if they are not motivated. Sometimes people give up easily when they encounter a problem or failure in implementing the first step. Therefore, there is a need to persist in their effort to find a solution.

Reasoning

If you find a person desperately running on the railway platform, you could infer a number of things such as: he is running to catch the train which is about to leave, he wants to see off his friend sitting in the train which is about to leave, he has left his bag in the train and wants to get in before the train leaves the station. To figure out why this person is running, you could use different kinds of reasoning, deductive or inductive.

Deductive and Inductive Reasoning

Since your previous experience indicates that people run on the platform to catch a train, you would conclude that this person is getting late and is running to catch the train.

The kind of reasoning that begins with an assumption is called *deductive reasoning*.

Thus deductive reasoning begins with making a general assumption that you know or believe to be true and then drawing specific conclusion based on this assumption. In other words, it is reasoning from general to particular. Your general assumption is that people run on the railway platform only when they are getting late for the train. The man is running on the platform. Therefore, he is getting late for the train. One mistake that you are making (and generally people do commit such mistakes in deductive reasoning) is that you (they) assume but do not always know if the basic statement or assumption is true. If the base information is not true, i.e. people also run on the platform for other reasons then your conclusion would be invalid or wrong. Look at the mouse in Fig.8.4.

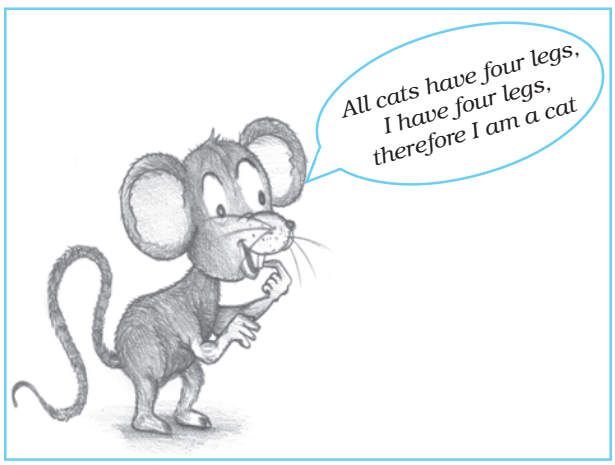


Fig.8.4 : Is the mouse making a True and Valid Conclusion?

Another way to figure out why the man is running on the platform is to use inductive reasoning. Sometimes you would analyse other possible reasons and observe what the man is actually doing and then draw a conclusion about his behaviour. Reasoning, that is based on specific facts and observation, is called inductive reasoning. Inductive reasoning is drawing a general conclusion based on particular observation. In the earlier example, you observed the other person's subsequent action or actions such as: entering into the train compartment and returning with a bag. Based on your observation you would conclude that the person had left his bag in the train. One mistake you would probably make here is jumping to a conclusion without knowing all possible facts.

From the above discussion we can conclude that reasoning is the process of gathering and analysing information to arrive at conclusions. In this sense, reasoning is also a form of problem solving. The goal is to determine what conclusion can be drawn from certain given information.

Most cases of scientific reasoning are inductive in nature. Scientists and even lay persons consider a number of instances and try to determine what general rule covers them all. Think of yourself using your knowledge of problem solving steps discussed earlier in planning for a play, or conducting a project. Your inductive reasoning is being applied here.

Analogy is another form of reasoning which involves four parts, A is to B as C is to D with the relation between the first two parts being the same as the relation between the last two. For example, water is to fish as air is to human; white is to snow as black is to coal. Analogies can be helpful in solving problems. They help us in identifying and visualising the salient attributes of an object or event, which would otherwise go unnoticed.

DECISION-MAKING

Inductive and deductive reasonings allow us to make judgments. In **judgment** we draw conclusions, form opinions, evaluate events, objects, based on knowledge and available evidences. Consider this example, the man is very talkative, likes to mix with people, can convince others with ease — he would be most suitable for a salesperson's job. Our judgment of this person is based on the specific characteristics of an expert salesperson. Here we will discuss how we make decisions and judgments.

Sometimes judgments are automatic and require no conscious effort by the person and occur as a matter of habit, for example,

applying brakes on seeing the red light. However, evaluating a novel or a literary text requires reference to your past knowledge and experience. Judging the beauty of a painting would involve your personal preferences. Thus our judgments are not independent of our beliefs and attitudes. We also make changes in our judgments based on newly acquired information. Consider this example. A new teacher joins the school, students make on-the-spot judgment of the teacher as being very strict. However, in subsequent classes, they closely interact with the teacher and make changes in their evaluation. Now they judge the teacher to be extremely student-friendly.

Many of the problems you solve each day require you to make decisions. What to wear for the party? What to eat for dinner? What to say to your friend? The answer to all these lies in picking or choosing one of several choices. In decision-making, we sometimes choose among options based on choices of personal significance. Judgment and decision-making are interrelated processes. In decision-making the problem before us is to choose among alternatives by evaluating the cost and benefit associated with each alternative. For example, when you have the option to choose between psychology and economics as subjects in Class XI, your decision would be based upon your interest, future prospects, availability of books, efficiency of teachers, etc. You could evaluate them by talking to seniors and faculty members and attending a few classes, etc. Decision-making differs from other types of problem solving. In decision-making we already know the various solutions or choices and one has to be selected. Suppose your friend is a very good player of badminton. S/he is getting an opportunity to play at the state level. At the same time the final examination is approaching and s/he needs to study hard for it. S/he will have to choose between two options, practising for badminton or studying for the final examination. In this situation her/his decision will be based upon evaluation of all possible outcomes.

You would observe that people differ in their priorities and therefore their decisions will differ. In real life situations we take quick decisions and therefore, it is not possible always to evaluate every situation thoroughly and exhaustively.

Nature and Process of Creative Thinking

You might have wondered at times how some one for the first time, thought of acts like planting a seed, or devising a wheel, or decorating the walls of caves with drawings, etc. Perhaps not satisfied with the old ways of carrying out day-to-day activities, such persons thought of something original. There are countless others whose creativity has led to the present day scientific and technological progress that we now enjoy. Music, painting, poetry, and other forms of art that give us pleasure and joy, are all products of creative thinking.

You might have heard about A.D. Karve, a botanist from our country, who got the UK's top energy award for devising a smokeless *'Chullah'*. He converted dry, useless sugarcane leaves into clean fuel. You might have also heard of Class XI student Ashish Panwar, who won a bronze medal for assembling a five feet tall robot at the First International Robotics Olympiad held at Glasgow. These are only a few examples of creativity. Try to think of some other examples of creativity in different fields.

It is important to remember that creative thinking is not always expressed in extraordinary work. One does not have to be a scientist or an artist to be a creative thinker. Everyone has the potential to be creative. Creative thinking can be applied in almost any area of human activity at different levels. It could be reflected in activities like writing, teaching, cooking, enacting roles, story telling, conversation, dialogues, asking questions, playing games, trying to solve day-to-day problems, organising activities, helping others resolve conflicts, and so on. This concept of 'Everyday Creativity', which is reflected in one's way of perceiving thinking and problem solving, is different from the 'special talent creativity' seen in outstanding creative achievements.

Nature of Creative Thinking

Creative thinking is distinguished from other types of thinking by the fact that it involves the production of novel and original ideas or solutions to problems. Sometimes, creative thinking is understood just as a new way of thinking or thinking differently. However, it is important to know that, besides novelty, originality is also an important characteristic of creative thinking. Every year new models of household appliances, tape-recorders, cars, scooters, and television sets produced may not be original unless unique features are added to these products. Creative thinking thus refers to originality and uniqueness of ideas or solutions that did not previously exist. Creative thinking is also generally characterised by what Bruner calls "effective surprise". If the product or idea is unusual, the response of most who experience it is one of instant surprise or of being startled.

Another important criterion that characterises creative thinking is its appropriateness in a particular context. Simply thinking of being different without any purpose, doing things in one's own ways, being non-conformist, indulging in fantasy without any purpose or coming out with a bizarre idea, is at times mistaken for creative thinking. Researchers tend to agree that thinking is said to be creative when it is *reality-oriented, appropriate, constructive,* and *socially desirable.*

J.P. Guilford, a pioneer in creativity research, proposed two types of thinking: **convergent** and **divergent**. Convergent thinking refers to thinking that is required to solve problems which have only one correct answer. The mind converges to the correct solution. To illustrate, look at the question given below. It is based on a number series, where you have to find the next number. Only one right answer is expected.

Q. 3,6,9..... what will come next?

Ans. 12.

Now you try to think of certain questions for which there is no one right answer but many answers. A few such questions are given below:

- *What are the various uses of cloth?*
- *What improvements will you suggest in a chair so that it becomes more comfortable and aesthetically pleasing?*
- *What will happen if examinations are abolished in schools?*

Answers to the above questions require divergent thinking which is an open-ended thinking where the individual can think of different answers to the questions or problems in terms of her/his experiences. Such kind of thinking helps in producing novel and original ideas.

Divergent thinking abilities generally include fluency, flexibility, originality, and elaboration.

- **Fluency** is the ability to produce many ideas for a given task or a problem. The more ideas a person produces, the higher his fluency ability. For example, more the number of uses of a paper cup, more would be the fluency.
- **Flexibility** indicates variety in thinking. It may be thinking of different uses of an object, or different interpretation of a picture, story or different ways of solving a problem. In case of uses of a paper cup, for example, one may give an idea to use it as a container or to draw a circle, etc.

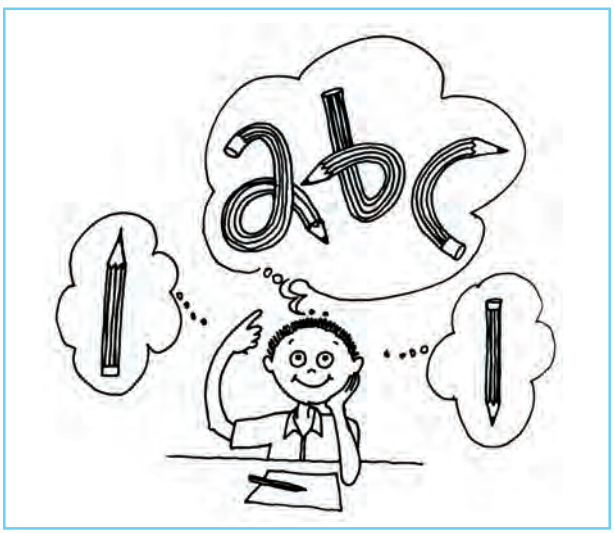


Fig.8.5 : Thinking Divergently

Box 8.2 Lateral Thinking

Edward de Bono has used the term 'lateral thinking' to what Guilford termed as divergent thinking. He makes a distinction between vertical thinking and lateral thinking. Vertical thinking involves mental operations that move in a straight line back and forth between lower and higher level concepts whereas lateral thinking involves looking for alternative ways of defining and interpreting problems. He states "vertical (logical) thinking digs the same hole deeper, i.e. thinking deeper in the same direction; lateral thinking is concerned with digging a hole in another place". De Bono suggests that lateral thinking can help make mental leaps and is likely to create a number of ways of thinking. De Bono developed the 'Six thinking hats' technique to stimulate different modes of thinking. One can put on or take off these hats according to the type of thinking required to be used. White hat means gathering information, facts, figures, and filling gaps in information. Red hat covers expression of feelings, and emotions on the subject. Black hat represents judgment, caution and logic. Yellow hat covers thinking on what will work and why it will be beneficial. Green hat is for creativity, alternatives and changes. Blue hat represents thinking about the process and not the ideas as such. The 'six thinking hats' reflect different perspectives from which an issue or problem is viewed. The technique can be used individually as well as in groups.

- **Originality** is the ability to produce ideas that are rare or unusual by seeing new relationships, combining old ideas with new ones, looking at things from different perspectives etc. Research has shown that fluency and flexibility are the necessary conditions for originality. The more and varied ideas one produces, the greater the likelihood of original ideas.
- **Elaboration** is the ability that enables a person to go into details and workout implications of new ideas.

Divergent thinking abilities facilitate generation of a variety of ideas which may not seem to be related. For example, what are the common ideas for enhancing food production? The likely answers would be related to quality of seeds, fertilizers, irrigation, and so on. If someone thinks of cultivation in a desert for extracting protein from weeds, it would be a remote idea. The association here is between 'food production' and 'desert' or 'weeds'. Ordinarily, we do not associate these together. But, if we let our mind free to seek new and remote associations, a number of combination of ideas may arise out of which one or two may turn out to be original. You must remember that both convergent and divergent thinking are important for creative thinking. Divergent thinking is essential in generating a wide range of ideas. Convergent thinking is important to identify the most useful or appropriate idea.

Activity 8.4

Frame five different kinds of questions requiring divergent thinking on issues and problems related to traffic management/pollution/corruption/illiteracy/poverty. Share and discuss in the class.

Process of Creative Thinking

In recent years, more and more attention has been given to the way the human mind operates. Research has made it clear that thinking of new and unusual ideas involve more than a flash of insight. There are stages before and after the new ideas come.

The starting point in creative process is the need to think or bring out something new which initiates the effort. Not everyone experiences this need, as one can be happy and contented, in carrying out routine work. The need for search of new ideas and solutions arises from sensing problems and gaps in information. The process of creative thinking begins with the **preparation** stage that

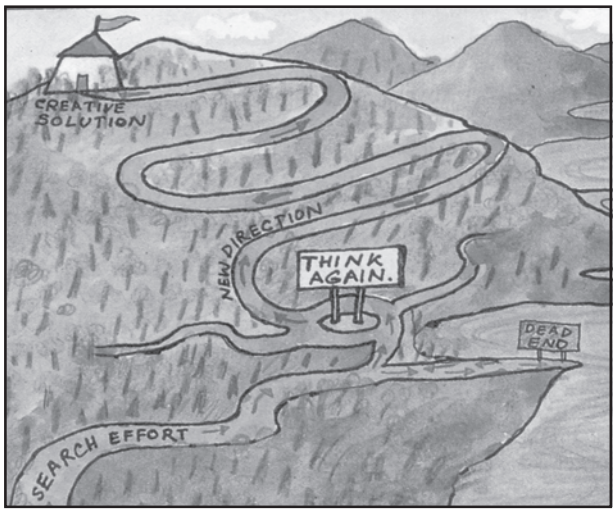


Fig.8.6 : The Creative Process

requires one to understand the task or problem in hand, analyse the problem, and become aware of the background facts and related information. The process evokes curiosity and excitement to think more and more in different directions. The person tries to look at the task or problem from different angles and viewpoints. Here, divergent thinking abilities discussed earlier play their role to help one extend in new directions.

Coming back to the process, when the person is trying to generate alternative ideas and trying to view the problem or task from an unusual perspective, there may be a feeling of getting stuck. One may even get disgusted with failure and may leave the problem or the task for sometime. This is the stage of **incubation**. Research shows that creative ideas may not occur immediately during incubation when the individual is not consciously thinking about the problem but seeking relaxation from conscious effort. They may occur or strike when a person is doing something else, for example, going to sleep, waking up, taking a bath or just walking along. Followed by incubation is the stage of **illumination** - the 'Aha'! or 'I have found it' experience, the moment we normally associate with emergence of creative ideas. There usually is, a feeling of excitement, even satisfaction, of having found a creative idea. Last is the stage of **verification** when the worth or appropriateness of ideas or solutions are tested and judged. Here, convergent thinking plays its role in selecting the appropriate idea or solution that works.

Developing Creative Thinking

As discussed in the previous section, you may recall that the potential for creative thinking is in all of us. It is not limited to a few talented artists or scientists or to a chosen few. The expression of creative thinking may vary from individual to individual. Although hereditary factors are important in determining the extent to which one can be creative, environmental factors facilitate or hamper the development of creative thinking abilities. Research in different countries including India has shown a slump in the level of creative thinking of school children at different stages due to environmental factors. On the other hand, research also indicates that children from lower socio-economic groups, ethnic and minority groups have substantial untapped creativity and that they are creative in many different ways.

Research has also shown that all of us can make better use of our abilities for creative thinking through practice and training. We can become more imaginative, flexible, and original in solving day-to-day problems creatively and effectively. Development of creative thinking is important for one's personal growth and fulfilment.

Barriers to Creative Thinking

The first step in developing creative thinking is to identify inhibiting factors that impede creative expression and then make conscious attempts to overcome the same. As we are discussing, you may analyse how you approach your tasks and problems.

There are blocks to creative thinking which can be categorised as habitual, perceptual, motivational, emotional, and cultural. Although much habitual learning is necessary for smooth and efficient functioning within the daily routine, the tendency to be overpowered by habits particularly in one's ways of thinking

can be detrimental to creative expression. We become so used to thinking and perceiving things in a familiar way that it becomes difficult to think in novel ways. It may be related to our tendency to quickly jump to conclusions, not to see problems from fresh perspectives, be satisfied with routine patterns of doing things, or resist to overcome pre-conceived viewpoints, and not to change immediate judgment, etc. The perceptual blocks prevent us from being open to novel and original ideas. Try to recall the joining dot problem in Activity 8.3, where you were required to connect all nine dots with four straight lines going through each dot only once without lifting the pencil or pen from the paper. The solution to the problem lies in going beyond the boundaries. We assume that boundaries exist whereas they did not. Many would attempt to solve the problem by staying in the square that the nine dots form. There is nothing in the directions to do this. The joining dots problem is indicative of the boundaries and the limitations that are assumed or self-imposed.

Motivational and emotional blocks also interfere with creative thinking which show that creative thinking is not merely a cognitive process. Lack of motivation, fear of failure, fear of being different, fear of ridicule or rejection, poor self-concept, negativism, etc. may hamper creative thinking. For example, some people may not be motivated enough to extend themselves and make extra efforts. A person may find that s/he can not do it further, may leave the problem in between or may accept the intermediate idea as the final idea. Further, some people, for example, have negative assumptions about themselves. They feel that they are not capable of doing some tasks. You may be surprised to know that Thomas Alva Edison, the inventor of the bulb, took years of experimentation with hundreds of failures before he produced the first bulb.

Cultural barriers are related to excessive adherence to traditions, expectations, conformity pressures, and stereotypes. Conformity to some extent is essential for social existence but excessive conformity to traditions, rituals, and procedures are likely to block creative thinking. Cultural blocks arise due to the fear of being different, the tendency to maintain status quo, willingness to accept mediocrity, preservation of personal security, social pressure, over dependence on others, etc.

The fact that everyone has the potential to be creative and that one can differ in one's expression of creative thinking requires that we all tap our creative potential and remove the barriers as discussed above.

Activity 8.5

Ponder over some statements that we often use and which may prevent or aid the emergence of those creative ideas. List those which may block new ideas like 'This is not logical', 'Time is too short to think any more', 'It would not work', etc. and positive statements like 'Is there any other way?', 'What else?', etc.

Strategies for Creative Thinking

Research on characteristics of creative people has revealed that there are certain attitudes, dispositions, and skills which facilitate creative thinking. Here are some strategies to help you enhance your creative thinking abilities and skills:

- Become more aware and sensitive to be able to notice and respond to feelings, sights, sounds, textures around you. Spot problems, missing information, anomalies, gaps, deficiencies, and so on. Try to notice contradictions and incompleteness in situations that others may not do. For this, cultivate the habit of wider reading, exposure to a variety of information, and develop the art of asking questions, pondering over the mysteries of situations and objects.
- Generate as many ideas, responses, solutions or suggestions on a given task or situation to increase your flow of thoughts. Try deliberately to look for multiple angles of a task and situation to increase flexibility in your thinking. It could be, for example, thinking of alternative arrangements of furniture in a room to generate more space, different

ways of conversing with people, looking for costs and benefits of a course of study or career, looking for ways of dealing with an angry friend, helping others, etc.

- Osborn's **Brainstorming** technique can be used to increase fluency and flexibility of ideas to open-ended situations. Brainstorming is based on the principle that producing ideas should be kept separate from the evaluation of their worth. The basic assumption is to let the minds think freely and the tendency to put judgment on the worth of ideas may be postponed, i.e. imagination should be given priority over judgment till all the ideas are exhausted. This helps in increasing the fluency of ideas and piling up alternatives. Brainstorming can be practised by playing brainstorming games with family members and friends keeping its principles in mind. Use of checklists and questions often provide a new twist for ideas like, What other changes? What else? In how many ways could it be done? What could be the other uses of this object? and so on.
- Originality can be developed by practicing fluency, flexibility, habit of associative thinking, exploring linkages, and fusing distinct or remote ideas. A creative thinker, it is said, may not evolve new ideas but evolve new combination of ideas. It is the chain of thoughts and cross-fertilisation of ideas that may bring out something new. The idea of the 'rocking chair' has come from the combination of 'chair' and 'see-saw'. Practice making unusual and unexpected associations using analogies. Sometimes finding original ideas/solutions requires a dramatic shift of focus which can be facilitated by asking oneself : what is the opposite of the commonplace or usual solution to the problem? Allow conflicting thoughts to co-exist. Looking for solutions opposite to the obvious may lead to original solutions.
- Engage yourself more frequently in activities which require use of imagination and original thinking rather than routine work according to your interest and hobbies. It may be decorating the house, improvising or redesigning of old objects, making use of waste products in multiple ways, completing incomplete ideas in unique ways, giving new twist to stories or poems, developing riddles, puzzles, solving mysteries and so on.
- Never accept the first idea or solution. Many ideas die because we reject them thinking that the idea might be a silly idea. You have to first generate a number of possible ideas or solutions, then select the best from among them.
- Get a feedback on the solutions you decide on from others who are less personally involved in the task.
- Try to think of what solutions someone else may offer for your problems.
- Give your ideas the chance to incubate. Allowing time for incubation between production of ideas and the stage of evaluation of ideas, may bring in the 'Aha!' experience.
- Sometimes ideas cluster like branches of a tree. It is useful to diagram your thinking so that you can follow each possible branch to its completion.
- Resist the temptation for immediate reward and success and cope with the frustration and failure. Encourage self-evaluation.
- Develop independent thinking in making judgments, figuring out things without any help or resources.
- Visualise causes and consequences and think ahead, predicting things that have never happened, like, suppose the time starts moving backwards, what would happen?, If we had no zero?, etc.
- Be aware of your own defenses concerning the problem. When we feel threatened by a problem we are less likely to think of creative ideas.
- Last but not the least, be self-confident and positive. Never undermine your creative potential. Experience the joy of your creation.

Thought and Language

Till now, we have discussed the nature and meaning of thinking and how thinking is based on images and concepts. We have also discussed the various processes of thought. Throughout the discussion did you feel that words or language are essential to express what we think? This section examines the relationship between language and thought: that language determines thought, that thought determines language, and that thought and language have different origins. Let us examine these three viewpoints in some detail.

Language as Determinant of Thought

In Hindi and other Indian languages we use a number of different words for various kinship relationships. We have different terms for mother's brother, father's elder brother, father's younger brother, mother's sister's husband, father's sister's husband, and so on. An English person uses just one word *uncle* to describe all these kinship relationships. In the English language there are dozens of words for colours whereas some tribal languages have only two to four colour terms. Do such differences matter for how we think? Does an Indian child find it easier to think about and differentiate between various kinship relationships compared to her English-speaking counterpart? Does our thinking process depend on how we describe it in our language?

Benjamin Lee Whorf was of the view that language determines the contents of thought. This view is known as **linguistic relativity hypothesis**. In its strong version, this hypothesis holds what and how individuals can possibly think is determined by the language and linguistic categories they use **(linguistic determinism)**. Experimental evidence, however, maintains that it is possible to have the same level or quality of thoughts in all languages depending upon the availability of linguistic categories and structures. Some thoughts may be easier in one language compared to another.

Thought as Determinant of Language

The noted Swiss psychologist, Jean Piaget believed that thought not only determines language, but also precedes it. Piaget argued that children form an internal representation of the world through thinking. For example, when children see something and later copy it (a process called imitation), thinking does take place, which does not involve language. A child's observation of other's behaviour and imitation of the same behaviour, no doubt involves thinking but not language. Language is just one of the vehicles of thinking. As actions become internalised, language may affect children's range of symbolic thinking but is not necessary for the origins of thought. Piaget believed that though language can be taught to children, understanding of the words require knowledge of the underlying concepts (i.e. thinking). Thus, thought is basic, and necessary if language is to be understood.

Different Origins of Language and Thought

The Russian psychologist, Lev Vyogotsky, argued that thoughts and language develop in a child separately until about two years of age, when they merge. Before two years thought is preverbal and is experienced more in action (Piaget's sensory motor stage). The child's utterances are more automatic reflexes - crying when uncomfortable - than thought-based. Around two years of age, the child expresses thought verbally and her/his speech reflects rationality. Now children are able to manipulate thoughts using soundless speech. He believed that during this period the development of language and thinking become interdependent; the development of conceptual thinking depends upon the quality of inner speech and vice versa. Thought is used without language when the vehicle of thinking is non-verbal such as visual or movement-related. Language is used without thought when expressing feelings or exchanging pleasantries, for example "Good morning! How are you?" "Very well, I am fine". When the two functions overlap, they can be used together to produce verbal thought and rational speech.

Development of Language and Language Use

Meaning and Nature of Language

In the previous section we discussed the relationship between language and thought. In this section, we will examine how human beings acquire and use language in different age groups. Think for a moment: what would have happened if you did not have a language to express whatever you wanted to say? In the absence of language you will not be able to communicate your ideas and feelings, nor will you have the opportunity to know or have access to what others think and feel. As a child when you first started saying "ma..ma..ma.", it not only gave you tremendous boost to continue repeating this activity but also was a great moment of joy for your parents and other care-givers. Slowly you learnt to say 'ma' and 'papa' and sometime later combined two or more words to communicate your needs, feelings, and thoughts. You learnt words appropriate for situations and also learnt the rules of putting these words in sentences. Initially you learnt to communicate in the language being used at home (usually the mother-tongue), went to school and learnt the formal language of instruction (in many cases this language is different from the mother-tongue), and were promoted to higher grades and learnt other languages. If you look back, you will realise that your journey from crying and saying "ma..ma..ma" to the attainment of mastery in not one but many languages, has been a fascinating one. In this section we shall be discussing the salient features of language acquisition.

You have been using language all your life. Now try to define accurately what it is that you have been using. Language *consists of a system of symbols organised by means of certain rules that we use to communicate with each other.* You will notice that language has three basic characteristics: (a) *the presence of symbols*, (b) *a set of rules* to organise these symbols, and (c) *communication*. Here we shall be discussing these three characteristics of language.

The first characteristic of language is that it involves *symbols*. Symbols represent something or someone else, for example, the place where you live is called 'home', the place where you study is called 'school', the thing that you eat is called 'food'. Words like home, school, food, and numerous other words do not in themselves carry any meaning. When these words are associated with some objects/events they attain meaning and we begin recognising those objects/events, etc. with particular words (symbols). We use symbols while thinking.

The second characteristic of language is that it involves *rules*. While combining two or more words we usually follow a definite and accepted order of presenting these words. For example, one would most likely say "I am going to school" and not "school am going I".

The third characteristic of language is that it is used *for communicating one's thought, ideas, intentions, and feelings to others*. On many occasions we communicate through the use of our body parts, called gestures or postures. This type of communication is called non-verbal communication. Some people who cannot use oral speech, like the ones with severe hearing and speech problems, communicate through signs. Sign language is also a form of language.

Development of Language

Language is a complex system and unique to human beings. Psychologists have tried to teach sign language, use of symbols to chimpanzees, dolphins, parrots, etc. But it is observed that, human language is more complex, creative, and spontaneous than the system of communication other animals can learn. There is also a great deal *of regularity* with which children all over the world seem to be learning the language or languages to which they are exposed. When you compare individual children, you find that they differ a

great deal in the rate of their language development as well as in how they go about it. But when you take a general view of children's acquisition of language all over the world you find some *predictable pattern* in which children proceed from almost no use of language to the point of becoming competent language users. Language develops through some of the stages discussed below.

Newborn babies and young infants make a variety of sounds, which gradually get modified to resemble words. The first sound produced by babies is *crying*. Initial crying is undifferentiated and similar across various situations. Gradually, the pattern of crying varies in its pitch and intensity to signify different states such as hunger, pain, and sleepiness, etc. These differentiated crying sounds gradually become more meaningful *cooing sounds* (like 'aaa', 'uuu', etc.) usually to express happiness.

At around six months of age children enter the *babbling* stage. Babbling involves prolonged repetition of a variety of consonants and vowel sounds (for example, da—, aa—, ba—). By about nine months of age these sounds get elaborated to strings of some sound combinations, such as 'dadadadadada' into repetitive patterns called *echolalia*. While the early babblings are random or accidental in nature, the later babblings seem to be imitative of adult voices. Children show some understanding of a few words by the time they are six months old. Around the first birthday (the exact age varies from child to child) most children enter the *one-word-stage*. Their first word usually contains one syllable – *ma or da*, for instance. Gradually they move to one or more words which are combined to form whole sentences or phrases. So they are called *holophrases*. When they are 18 to 20 months of age, children enter a *two-word stage* and begin to use two words together. The two-word stage exemplifies *telegraphic speech*. Like telegrams (got admission, send money) it contains mostly nouns and verbs. Close to their third birthday, i.e. beyond two-and-a-half years, children's language development gets focused on rules of the language they hear.

How is language acquired? You must be wondering: "How do we learn to speak?" As with many other topics in psychology, the question of whether a behaviour develops as a result of inherited characteristics (nature) or from the effects of learning (nurture) has been raised with regard to language. Most psychologists accept that both nature and nurture are important in language acquisition.

Behaviourist B.F. Skinner believed we learn language the same way as animals learn to pick keys or press bars (refer to Chapter 6 on Learning). Language development, for the behaviourists follow the learning principles, such as association (the sight of bottle with the word 'bottle'), imitation (adults use of word "bottle"), and reinforcement (smiles and hugs

Box 8.3 Bilingualism and Multilingualism

Bilingualism refers to attaining proficiency in communicating through any two languages. Learning of more than two languages is referred to as multilingualism. The term mother tongue has been variously defined as one's native language, the language spoken by the individual from the cradle; language ordinarily used at home; language spoken by the mother; etc. However, generally the mother tongue is viewed as a language with which one identifies at the emotional level. It is possible for individuals to have multiple mother tongues. The Indian social context is characterised by grass root multilingualism which makes bi/multilingualism a characteristic at the levels of individual as well as society. Most Indians use more than one language to communicate in various domains of their daily life activities. Thus, multilingualism is a way of life in India. Studies reveal that bilingualism/multilingualism facilitates cognitive, linguistic, and academic competence of children.

when the child says something right). There is also evidence that children produce sounds that are appropriate to a language of the parent or care-giver and are reinforced for having done so. The principle of shaping leads to successive approximation of the desired responses so that the child eventually speaks as well as the adult. Regional differences in pronunciation and phrasing illustrate how different patterns are reinforced in different areas.

Linguist Noam Chomsky put forth the innate proposition of development of language. For him the *rate at which children acquire words and grammar* without being taught can not be explained only by learning principles. Children also *create all sorts of sentences* they have never heard and, therefore, could not be imitating. Children throughout the world seem to have a *critical period* — a period when learning must occur if it is to occur successfully — for learning language. Children across the world also go through the same stages of language development. Chomsky believes language development is just like physical maturation- given adequate care, it "just happens to the child". Children are born with "universal grammar". They readily learn the grammar of whatever language they hear.

Skinner's emphasis on learning explains why infants acquire the language they hear and how they add new words to their vocabularies. Chomsky's emphasis on our built-in readiness to learn grammar helps explain why children acquire language so readily without direct teaching.

Language Use

As we have discussed earlier, language use involves knowing socially appropriate ways of communication. Knowledge of vocabulary and syntax of a language does not ensure proper use of language to achieve the purpose of communication in a variety of social situations. When we use language we have various pragmatic intentions such as requesting, asking, thanking, demanding, etc. In order to effectively serve these social goals, language use must be pragmatically correct or contextually appropriate besides being grammatical and meaningful. Children often have difficulty with choice of appropriate utterances for politeness or for requests and their use of language conveys a demand or a command instead of a polite request. When children are engaged in conversations, they also have difficulty in taking turns in speaking and listening like adults.

Key Terms

Bilingualism, Brainstorming, Concepts, Convergent thinking, Creativity, Decision-making, Deductive reasoning, Divergent thinking, Functional fixedness, Illumination, Images, Incubation, Inductive reasoning, Judgment, Language, Mental representation, Mental set, Multilingualism, Problem solving, Reasoning, Remote association, Syntax, Thinking

Summary

- *Thinking is a complex mental process through which we manipulate information (either acquired or stored). It is an internal process that can be inferred from behaviour. Thinking involves mental representations that are either mental images or concepts.*
- *Complex thought processes are problem solving, reasoning, decision-making, judgment, and creative thinking.*
- *Problem solving is thinking directed towards the solution of a specific problem.*
- *Mental set, functional fixedness, lack of motivation and persistence are some of the hindrances for effective problem solving.*

- *Reasoning, like problem solving, is goal directed, involves inference and can be either deductive or inductive.*
- *In making judgment, we draw conclusions, form opinions, make evaluations about objects or events.*
- *In decision-making one must choose among several available alternatives.*
- *Judgment and decision-making are interrelated processes.*
- *Creative thinking involves the production of something new and original — it may be an idea, object or solution to a problem.*
- *Developing creative thinking requires overcoming blocks to creative expression and using strategies to enhance creative thinking skills and abilities.*
- *Language is distinctly human. It consists of symbols, organised on the basis of certain rules to communicate intentions, feelings, motives, and desires among human beings.*
- *Major development in language occurs during the first two to three years of age.*
- *Language and thought are intricately related.*

Review Questions

1. Explain the nature of thinking.
2. What is a concept? Explain the role of concept in the thinking process.
3. Identify obstacles that one may encounter in problem solving.
4. How does reasoning help in solving problems?
5. Are judgment and decision-making interrelated processes? Explain.
6. Why is divergent thinking important in creative thinking process?
7. What are the various barriers to creative thinking?
8. How can creative thinking be enhanced?
9. Does thinking take place without language? Discuss.
10. How is language acquired in human beings?

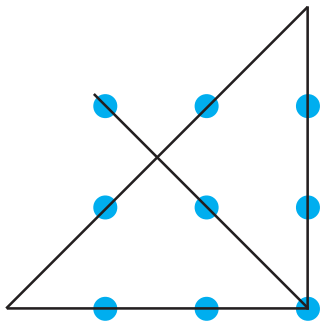
Project Ideas

1. Observe children of 1 year, 2 years, and 3 years old over a period of one week. Record the speech and note how the child is learning words and how many words the child has learnt over this period.
2. Make a collage of news headlines, advertisements, cartoons etc. and arrange them in your own way to depict a particular theme or a context other than the one in which they were used. Write an original message or slogan to describe it. Reflect on the steps and the barriers you experienced in thinking of original ideas.

Answers to problems in Activity 8.3

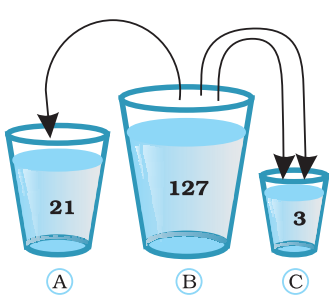
Problem 1 : ANAGRAM, PROBLEM, SOLVE, INSIGHT, SOLUTION.

Problem 2 :

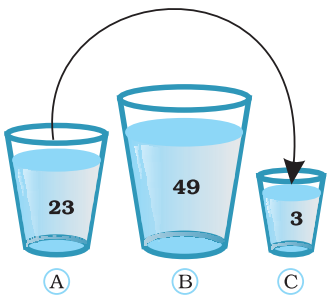


Problem 3 :
The solution for this problem is fill bottle B (127 ml) completely and then pour out water in bottle A (21 ml) to fill it completely. Now 106 ml is left in bottle B (127ml–21ml). Next pour enough water out of B to fill up C (3 ml), and then empty the bottle C by pouring out all the water from C. Now there is 103 ml of water in B and C is empty. Then again pour water from B to fill up C. Now you will be left with 100 ml of water in B.

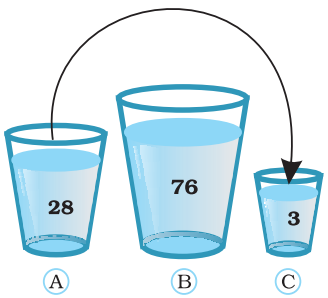
In case of the first 5 problems, the desired amount can be reached by the sequence B–A–2C. However, the 6th and 7th problems are critical. In the 6th problem, the desired amount of water is 20 ml and the capacity of the three bottles are: A can hold 23 ml, B can hold 49 ml and C can hold 3 ml. Observe how the participant is solving this problem. Most likely he would successfully solve the problem by following the already tried sequence {49–23–(2 X 3)} without even thinking or trying a simpler and quick method of pouring water from A to C. If your friend is following this procedure then you can conclude that solving the 5 problems has formed a mental set in her/his mind. The 7th problem requires a direct solution of pouring water from A to C. But the mental set is so powerful that many would fail to think of any other steps, other than the already tried one.



The standard method
Problems 1-5



A simpler method
Problem 6



A case where only the simple method works
Problem 7

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Chapter 9

Motivation and Emotion

After reading this chapter, you would be able to

- understand the nature of human motivation,
- describe the nature of some important motives,
- describe the nature of emotional expression,
- understand the relationship between culture and emotion, and
- know how to manage your own emotions.

Emotion has taught mankind to reason.

– Marquis de Vauvenargues

Contents

Introduction
Nature of Motivation
Types of Motives
Biological Motives
Psychosocial Motives
Maslow's Hierarchy of Needs
Self-Motivation (Box 9.1)
Nature of Emotions
Physiological Bases of Emotions
Physiology of Emotion (Box 9.2)
Lie Detection (Box 9.3)
Cognitive Bases of Emotions
Cultural Bases of Emotions
Expression of Emotions
Culture and Emotional Expression
Culture and Emotional Labeling
Managing Negative Emotions
Post-Traumatic Stress Disorder (Box 9.4)
Management of Examination Anxiety (Box 9.5)
Enhancing Positive Emotions
Emotional Intelligence (Box 9.6)

Key Terms
Summary
Review Questions
Project Ideas

Introduction

Sunita, a girl from a little known town, puts in 10-12 hours of hard work everyday in order to get through the various engineering entrance examinations. Hemant, a physically challenged boy, wants to take part in an expedition and trains himself extensively in a mountaineering institute. Aman saves money from his scholarship so that he can buy a gift for his mother. These are just a few examples, which indicate the role motivation plays in human behaviour. Each of these behaviours are caused by an underlying motive. Behaviour is goal-driven. Goal-seeking behaviour tends to persist until the goal is achieved. For achieving their goals people plan and undertake different activities. How is Sunita going to feel if after all the hard work she has put in, she does not succeed or Aman's scholarship money gets stolen. Sunita, perhaps, will be sad and Aman angry. This chapter will help you to understand the basic concepts of motivation and emotion, and related developments in these two areas. You will also get to know the concepts of frustration and conflict. The basic emotions, their biological bases, overt expressions, cultural influences, their relationship with motivation, and some techniques to help you manage your emotions better will also be dealt with.

Nature of Motivation

The concept of motivation focuses on explaining what "moves" behaviour. In fact, the term motivation is derived from the Latin word *'movere'*, referring to movement of activity. Most of our everyday explanation of behaviour is given in terms of motives. Why do you come to the school or college? There may be any number of reasons for this behaviour, such as you want to learn or to make friends, you need a diploma or degree to get a good job, you want to make your parents happy, and so on. Some combination of these reasons and/or others would explain why you choose to go in for higher education. Motives also help in making predictions about behaviour. A person will work hard in school, in sports, in business, in music, and in many other situations, if s/he has a very strong need for achievement. Hence, motives are the general states that enable us to make predictions about behaviour in many different situations. In other words, motivation is one of the determinants of behaviour. Instincts, drives, needs, goals, and incentives come under the broad cluster of motivation.

The Motivational Cycle

Psychologists now use the concept of need to describe the motivational properties of behaviour. *A need is lack or deficit of some necessity.* The condition of need leads to drive.

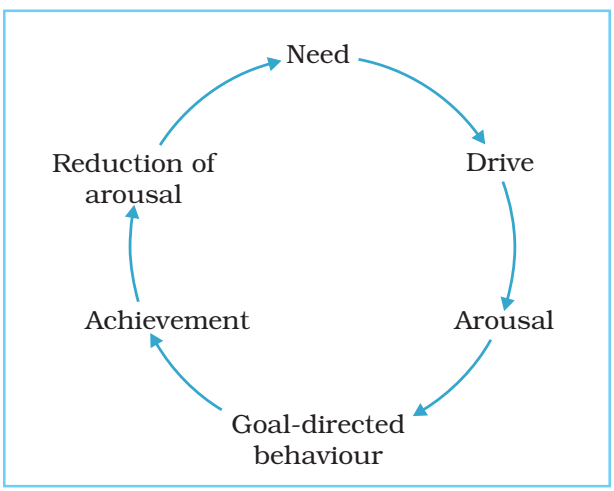

Fig.9.1 : The Motivational Cycle

A drive is a state of tension or arousal produced by a need. It energises random activity. When one of the random activities leads to a goal, it reduces the drive, and the organism stops being active. The organism returns to a balanced state. Thus, the cycle of motivational events can be presented as shown in Fig.9.1.

Are there different types of motives? Are there any biological bases explaining different kinds of motives? What happens if your motive remains unfulfilled? These are some of the questions we will discuss in the following sections.

Types of Motives

Basically, there are two types of motives : biological and psychosocial. Biological motives are also known as physiological motives as they are guided mostly by the physiological mechanisms of the body. Psychosocial motives, on the other hand, are primarily learned from the individual's interactions with the various environmental factors.

However, both types of motives are interdependent on each other. That is, in some kind of situations the biological factors may trigger a motive whereas in some other situations, the psychosocial factors may trigger the motive. Hence, you should keep in mind that no motive is absolutely biological or psychosocial *per se*, rather they are aroused in the individual with varying combinations.

Biological Motives

The biological or physiological approach to explain motivation is the earliest attempt to understand causes of behaviour. Most of the theories, which developed later, carry traces of the influence of the biological approach. The approach adhering to the concept of adaptive act holds that organisms have needs (internal physiological imbalances) that produce drive, which stimulates behaviour leading to certain actions towards achieving certain goals, which reduce the drive. The earliest explanations of motivation relied on the concept of instinct. The term *instinct* denotes inborn patterns of behaviour that are biologically determined rather than learned. Some common human instincts include curiosity, flight, repulsion, reproduction, parental care, etc. Instincts are innate tendencies found in all members of a species that direct behaviour in predictable ways. The term instinct most approximately refers to *an urge to do something*. Instinct has an *"impetus"* which drives the organism to do something to reduce that impetus. Some of the basic **biological needs** explained by this approach are hunger, thirst, and sex, which are essential for the sustenance of the individual.

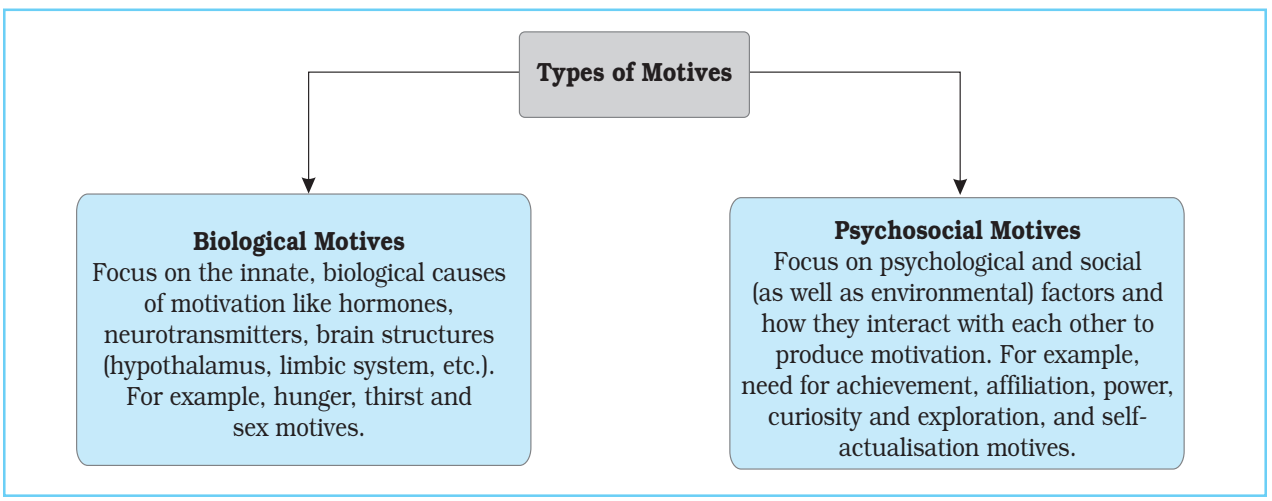
Types of Motives
Biological Motives
Focus on the innate, biological causes of motivation like hormones, neurotransmitters, brain structures (hypothalamus, limbic system, etc.). For example, hunger, thirst and sex motives.
Psychosocial Motives
Focus on psychological and social (as well as environmental) factors and how they interact with each other to produce motivation. For example, need for achievement, affiliation, power, curiosity and exploration, and self-actualisation motives.

Fig.9.2 : Types of Motives

Hunger

When someone is hungry, the need for food dominates everything else. It motivates people to obtain and consume food. Of course we must eat to live. But, what makes you feel hungry? Studies have indicated that many events inside and outside the body may trigger hunger or inhibit it. The stimuli for hunger include stomach contractions, which signify that the stomach is empty, a low concentration of glucose in the blood, a low level of protein and the amount of fats stored in the body. The liver also responds to the lack of bodily fuel by sending nerve impulses to the brain. The aroma, taste or appearance of food may also result in a desire to eat. It may be noted that none of these alone gives you the feeling that you are hungry. All in combination act with external factors (such as taste, colour, by observing others eating, and the smell of food, etc.) to help you understand that you are hungry. Thus, it can be said that our food intake is regulated by a complex feeding-satiety system located in the hypothalamus, liver, and other parts of the body as well as the external cues available in the environment.

Some physiologists hold that changes in the metabolic functions of the liver result in a feeling of hunger. The liver sends a signal to a part of the brain called hypothalamus. The two regions of hypothalamus involved in hunger are - the lateral hypothalamus (LH) and the ventro-medial hypothalamus (VMH). LH is considered to be the excitatory area. Animals eat when this area is stimulated. When it is damaged, animals stop eating and die of starvation. The VMH is located in the middle of the hypothalamus, which is otherwise known as hunger-controlling area which inhibits the hunger drive. Now can you guess about people who overeat and become obese, and people who eat very little or who are on a diet?

Thirst

What would happen to you, if you were deprived of water for a long time? What makes you feel thirsty? When we are deprived of water for a period of several hours, the mouth and throat become dry, which leads to dehydration of body tissues. Drinking water is necessary to wet a dry mouth. But a dry mouth does not always result in water drinking behaviour. In fact processes within the body itself control thirst and drinking of water. Water must get into the tissues sufficiently to remove the dryness of mouth and throat.

Motivation to drink water is mainly triggered by the conditions of the body: loss of water from cells and reduction of blood volume. When water is lost by bodily fluids, water leaves the interior of the cells. The anterior hypothalamus contains nerve cells called 'osmoreceptors', which generate nerve impulses in case of cell dehydration. These nerve impulses act as a signal for thirst and drinking; when thirst is regulated by loss of water from the osmoreceptors, it is called cellular-dehydration thirst. But what mechanisms stop the drinking of water? Some researchers assume that the mechanism which explains the intake of water is also responsible for stopping the intake of water. Others have pointed out that the role of stimuli resulting from the intake of water in the stomach must have something to do with stopping of drinking water. However, the precise physiological mechanisms underlying the thirst drive are yet to be understood.

Sex

One of the most powerful drives in both animals and human beings is the sex drive. Motivation to engage in sexual activity is a very strong factor influencing human behaviour. However, sex is far more than a biological motive. It is different from other primary motives (hunger, thirst) in many ways like, (a) sexual activity is not necessary for an individual's survival; (b) homeostasis (the tendency of the organism as a whole to maintain constancy or to attempt to restore equilibrium if constancy is disturbed) is not the goal of sexual activity; and (c) sex drive develops with age, etc. In case of lower animals, it depends on many physiological

conditions; in case of human beings, the sex drive is very closely regulated biologically, sometimes it is very difficult to classify sex purely as a biological drive.

Physiologists suggest that intensity of the sexual urge is dependent upon chemical substances circulating in the blood, known as sex hormones. Studies on animals as well as human beings have mentioned that sex hormones secreted by gonads, i.e. testes in males and the ovaries in females are responsible for sexual motivation. Sexual motivation is also influenced by other endocrine glands, such as adrenal and pituitary glands. Sexual drive in human beings is primarily stimulated by external stimuli and its expression depends upon cultural learning.

Psychosocial Motives

Social motives are mostly learned or acquired. Social groups such as family, neighbourhood, friends, and relatives do contribute a lot in acquiring social motives. These are complex forms of motives mainly resulting from the individual's interaction with her/his social environment.

Need for Affiliation

Most of us need company or friend or want to maintain some form of relationship with others. Nobody likes to remain alone all the time. As soon as people see some kinds of similarities among themselves or they like each other, they form a group. Formation of group or collectivity is an important feature of human life. Often people try desperately to get close to other people, to seek their help, and to become members of their group. Seeking other human beings and wanting to be close to them both physically and psychologically is called affiliation. It involves motivation for social contact. Need for affiliation is aroused when individuals feel threatened or helpless and also when they are happy. People high on this need are motivated to seek the company of others and to maintain friendly relationships with other people.

Need for Power

Need for power is an ability of a person to produce intended effects on the behaviour and emotions of another person. The various goals of power motivation are to influence, control, persuade, lead, and charm others and most importantly to enhance one's own reputation in the eyes of other people.

David McClelland (1975) described four general ways of expression of the power motive. First, people do things to gain feeling of power and strength from sources outside themselves by reading stories about sports stars or attaching themselves to a popular figure. Second, power can also be felt from sources within us and may be expressed by building up the body and mastering urges and impulses. Third, people do things as individuals to have an impact on others. For example, a person argues, or competes with another individual in order to have an impact or influence on that person. Fourth, people do things as members of organisations to have an impact on others as in the case of the leader of a political party; the individual may use the party apparatus to influence others. However, for any individual, one of these ways of expressing power motivation may dominate, but with age and life experiences, it varies.

Need for Achievement

You might have observed some students work very hard and compete with others for good marks/grades in the examination, as good marks/grades will create opportunities for higher studies and better job prospects. It is the achievement motivation, which refers to the desire of a person to meet standards of excellence. Need for achievement, also known as n-Ach, energises and directs behaviour as well as influences the perception of situations.

During the formative years of social development, children acquire achievement motivation. The sources from which they learn it, include parents, other role models, and socio-cultural influences. Persons high in achievement motivation tend to prefer tasks that are moderately difficult and challenging.

They have stronger-than-average desire for feedback on their performance, that is to know how they are doing, so that they can adjust their goals to meet the challenge.

Curiosity and Exploration

Often people engage in activities without a clear goal or purpose but they derive some kind of pleasure out of it. It is a motivational tendency to act without any specific identifiable goal. The tendency to seek for a novel experience, gain pleasure by obtaining information, etc. are signs of curiosity. Hence, curiosity describes behaviour whose primary motive appears to remain in the activities themselves.

What will happen if the sky falls on us? Questions of this kind (What will happen if...) stimulate intellectuals to find answers. Studies show that this curiosity behaviour is not only limited to human beings, animals too show the same kind of behaviour. We are driven to explore the environment by our curiosity and our need for sensory stimulation. The need for varied types of sensory stimulations is closely related to curiosity. It is the basic motive, and exploration and curiosity are the expressions of it.

Our ignorance about a number of things around us becomes a powerful motivator to explore the world. We get easily bored with repetitive experiences. So we look for something new.

In the case of infants and small children, this motive is very dominant. They get satisfaction from being allowed to explore, which is reflected in their smiling and babbling. Children become easily distressed, when the motive to explore is discouraged, as you have read in Chapter 4.

Maslow's Hierarchy of Needs

There are various views on human motivation, the most popular among these is given by Abraham H. Maslow (1968; 1970). He attempted to portray a picture of human behaviour by arranging the various needs in a hierarchy. His viewpoint about motivation is very popular because of its theoretical and applied value which is popularly known as the "Theory of Self-actualisation" (see Fig.9.3).

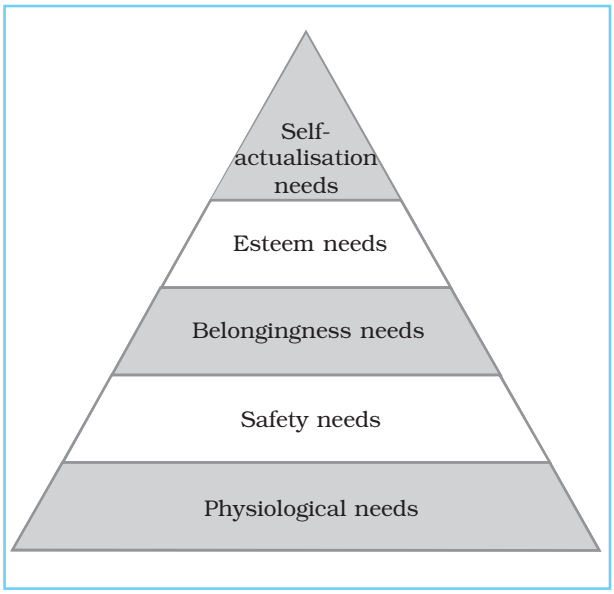

Fig.9.3 : Maslow's Hierarchy of Needs

Maslow's model can be conceptualised as a pyramid in which the bottom of this hierarchy represents basic physiological or biological needs which are basic to survival such as hunger, thirst, etc. Only when these needs are met, the need to be free from threatened danger arises. This refers to the safety needs of physical and psychological nature. Next comes the need to seek out other people, to love and to be loved. After these needs are fulfilled, the individual strives for esteem, i.e. the need to develop a sense of self-worth. The next higher need in the hierarchy reflects an individual's motive towards the fullest development of potential, i.e. self-actualisation. A self-actualised person is self-aware, socially responsive, creative, spontaneous, open to novelty, and challenge. S/he also has a sense of humour and capacity for deep interpersonal relationships.

Lower level needs (physiological) in the hierarchy dominate as long as they are unsatisfied. Once they are adequately satisfied, the higher needs occupy the individual's attention and effort. However, it

must be noted that very few people reach the highest level because most people are concerned more with the lower level needs.

Activity 9.1

Actual actions sometimes contradict the hierarchy of needs. Soldiers, police officers, and fire personnels have been known to protect others by facing very endangering situations, seemingly in direct contradiction to the prominence of safety needs.

Why does it happen? Discuss it in your group and then with your teacher.

Frustration and Conflict

So far we have taken a look at the various theoretical perspectives on motivation. They explain the process of motivation and what leads to motivated action and what are the reasons for different motives. Now we will try to understand what happens when motivated action is blocked or it fails due to certain reasons. We will also try to understand what happens when one is faced with more than one motive or need at the same time. These two concerns can be explained in the form of two important concepts related to motivation, namely **frustration** and **conflict**.

Frustration

We come across many occasions when things go in an unexpected direction and we fail to realise our goal. The blocking of a desired goal is painful, but all of us experience it in life in different degrees. *Frustration occurs when an anticipated desirable goal is not attained and the motive is blocked.* It is an aversive state and no one likes it. Frustration results in a variety of behavioural and emotional reactions. They include aggressive behaviour, fixation, escape, avoidance, and crying. In fact **frustration-aggression** is a very famous **hypothesis** proposed by Dollard and Miller. It states that frustration produces aggression. Aggressive acts are often directed towards the self or blocking agent, or a substitute. Direct aggressive acts may be inhibited by the threat of punishment. The main sources or causes of frustration are found in: (i) *environmental forces*, which could be physical objects, constraining situations or even other people who prevent a person from reaching a particular goal, (ii) *personal factors* like inadequacies or lack of resources that make it difficult or impossible to reach goals, and (iii) *conflicts* between different motives.

Conflict

Conflict occurs whenever a person must choose between contradictory needs, desires, motives, or demands. There are three basic forms of conflicts, for example, **approach-approach conflict**, **avoidance-avoidance conflict**, and **approach-avoidance conflict**.

Approach-approach conflict comes from having to choose between two positives and

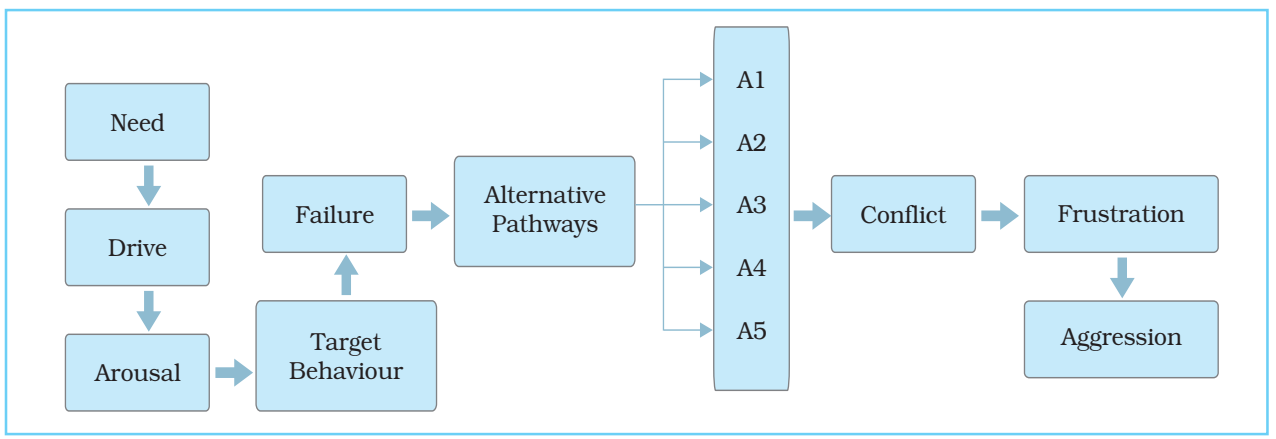

Fig.9.4 : Need-Conflict-Frustration Route

Box 9.1 Self-Motivation

Here are a few ways of motivating your own self as well as others:

1. *Be planned and organised in whatever you do.*
2. *Learn to prioritise your goals (Rank them 1,2, 3...).*
3. *Set short-term targets (In a few days, a week, a month, and so on).*
4. *Reward yourself for hitting the set targets (You could reward yourself with small things like a new pen, chocolates or anything that you want to have but attach it with some small goal).*
5. *Compliment yourself on being an achiever each time you hit a target (Say "Cheers! I did it", "I am really good with that", "I think I can do things smartly", etc.).*
6. *If the targets seem difficult to attain, again break them up into smaller ones and approach them one by one.*
7. *Always try to visualise or imagine the outcomes of all the hard work you have to put in to reach your set goals.*

desirable alternatives. Avoidance-avoidance conflict comes from choosing between two negatives, or mutually undesirable alternatives. In real life, these double avoidance conflicts involve dilemmas such as choosing between the dentist and tooth decay, roadside food and starvation, etc. Approach-avoidance conflict comes from being attracted to and repelled by the same goal or activity. These types of conflicts are also difficult to resolve, as they are more troublesome than avoidance conflicts. A central characteristic of approach-avoidance conflict is ambivalence — a mix of positive and negative conflicts. Some examples of approach-avoidance conflicts are: a person wanting to buy a new motorbike but not wanting to make monthly payments, wanting to eat when one is overweight, and planning to marry someone her/his parents strongly disapprove of. Many of life's important decisions have approach-avoidance dimensions.

A major source of frustration lies in motivational conflict. In life, we are often influenced by a number of competing forces that propel us in different directions. Such situations demonstrate the condition of conflict. Hence, the *simultaneous existence of multiple wishes and needs characterise conflict.*

In all the cases of conflicts, the selection of one option against the other depends on the relative strength/importance of one over the other, and environmental factors. Conflicting situations should be resolved after due consideration of the pros and cons of each of the choices. A point to note here is that conflicts cause frustration, which in turn, can lead to aggression. For instance, a young man who wants to be a musician but is pursuing a course in management due to parental pressure and is not able to perform as per the expectations of his parents may turn aggressive upon being questioned on his poor performance in the course.

Activity 9.2

Try to answer the following questions and work on the weaker areas:

1. *List the plans/activities you intend to undertake during this week.*
2. *Do you have any goals set for the month ahead? If yes, what are they? Try to list them.*
3. *Do you have a daily routine chart? If not, then try to prepare one by distributing your time judiciously for studies, rest, recreation, and other activities, if any.*
4. *Are you able to follow your routine chart successfully? (If you already have one).*
5. *If you are not able to follow a routine successfully think about the ways in which you could overcome your irregular habits and try to follow them.*

Nature of Emotions

'Swati is very happy. Her examination result has been declared today and she has topped the class. She is feeling euphoric. However, her friend Pranoy is feeling sad, as he has not done well. Among her friends some are feeling jealous of Swati's achievement. Jeevan who has not performed up to his expectation is angry with himself; he feels unhappy that his parents would be very disappointed'.

Joy, sorrow, hope, love, excitement, anger, hate, and many such feelings are experienced in the course of the day by all of us. The term emotion is often considered synonymous with the terms 'feeling' and 'mood'. Feeling denotes the pleasure or pain dimension of emotion, which usually involves bodily functions. Mood is an affective state of long duration but of lesser intensity than emotion. Both these terms are narrower than the concept of emotion. Emotions are a complex pattern of arousal, subjective feeling, and cognitive interpretation. Emotions, as we experience them, move us internally, and this process involves physiological as well as psychological reactions.

Emotion is a subjective feeling and the experience of emotions varies from person to person. In psychology, attempts have been made to identify basic emotions. It has been noted that at least six emotions are experienced and recognised everywhere. These are: anger, disgust, fear, happiness, sadness, and surprise. Izard has proposed a set of ten basic emotions, i.e. joy, surprise, anger, disgust, contempt, fear, shame, guilt, interest, and excitement with combinations of them resulting in other emotional blends. According to Plutchik, there are eight basic or primary emotions. All other emotions result from various mixtures of these basic emotions. He arranged these emotions in four pairs of opposites, i.e. joy-sadness, acceptance-disgust, fear-anger, and surprise-anticipation.

Emotions vary in their intensity (high, low) and quality (happiness, sadness, fear). Subjective factors and situational contexts influence the experience of emotions. These factors are gender, personality, and psychopathology of certain kinds. Evidence indicates that women experience all the emotions except anger more intensely than men. Men are prone to experience high intensity and frequency of anger. This gender difference has been attributed to the social roles attached to men (competitiveness) and women (affiliation and caring).

Physiological Bases of Emotions

'*Divya is desperate to get a job. She has prepared well for the interview and feels confident. As she enters the room and the interview begins, she becomes extremely tense. Her feet go cold, her heart starts pounding, and she is unable to answer appropriately'.*

Why did this happen? Try thinking about a similar situation that you have faced sometime in your life. Can you describe probable reasons for this? As we will see, a great deal of physiological changes happen when we experience emotion. When we are excited, afraid or angry, these bodily changes might be relatively easy to note. All of you must have noted the increase in heart rate, throbbing temples, increased perspiration, and trembling in your limbs when you are angry or excited about something. Sophisticated equipment has made it possible to measure the exact physiological changes that accompany emotions. Both autonomic as well as somatic nervous system play important roles in the emotional process. The experience of emotions is a result of a series of neurophysiological activations in which thalamus, hypothalamus, limbic system, and the cerebral cortex are involved significantly. Individuals with extensive injury in these brain areas have been known to demonstrate impaired emotional abilities. Selective activation of different brain areas has been experimentally shown to arouse different emotions in infants and adults.

One of the earliest physiological theories of emotion was given by James (1884) and

Box 9.2 Physiology of Emotion

The nervous system, central as well as peripheral, plays a vital role in the regulation of emotion.

Thalamus : *It is composed of a group of nerve cells and acts as a relay center of sensory nerves. Stimulation of thalamus produces fear, anxiety, and autonomic reactions. A theory of emotion given by Cannon and Bard (1931) emphasises the role of thalamus in mediating and initiating all emotional experiences.*

Hypothalamus : *It is considered the primary center for regulation of emotion. It also regulates the homeostatic balance, controls autonomic activity and secretion of endocrine glands, and organises the somatic pattern of emotional behaviour.*

Limbic System : *Along with thalamus and hypothalamus the limbic system plays a vital role in regulation of emotion. Amygdala is a part of limbic system, responsible for emotional control and involves formation of emotional memories.*

Cortex : *Cortex is intimately involved in emotions. However, its hemispheres have a contrasting role to play. The left frontal cortex is associated with positive feelings whereas the right frontal cortex with negative feelings.*

supported by Lange, hence, it has been named the **James-Lange theory** of emotion (see Fig.9.5). The theory suggests that environmental stimuli elicit physiological responses from viscera (the internal organs like heart and lungs), which in turn, are associated with muscle movement. For example, startling at an unexpected intense noise triggers activation in visceral and muscular organs followed by an emotional arousal. Put in other words, James-Lange theory argues that your perception about your bodily changes, like rapid breathing, a pounding heart, and running legs, following an event, brings forth emotional arousal. The main implication made by this theory is that particular events or stimuli provoke particular physiological changes and the individual's perception of these changes results in the emotion being experienced.

However, this theory faced a lot of criticism and fell in disuse. Another theory was proposed by Cannon (1927) and Bard (1934). **The Cannon-Bard theory** claims that the entire process of emotion is mediated by thalamus which after perception of the emotion-provoking stimulus, conveys this information simultaneously to the cerebral cortex and to the skeletal muscles and sympathetic nervous system. The cerebral cortex then determines the nature of the perceived stimulus by referring to past experiences. This determines the subjective experience of the emotion. At the same time the sympathetic nervous system and the muscles provide physiological arousal and prepare the individual to take action (see Fig.9.6).

The ANS is divided into two systems, sympathetic and parasympathetic. These two

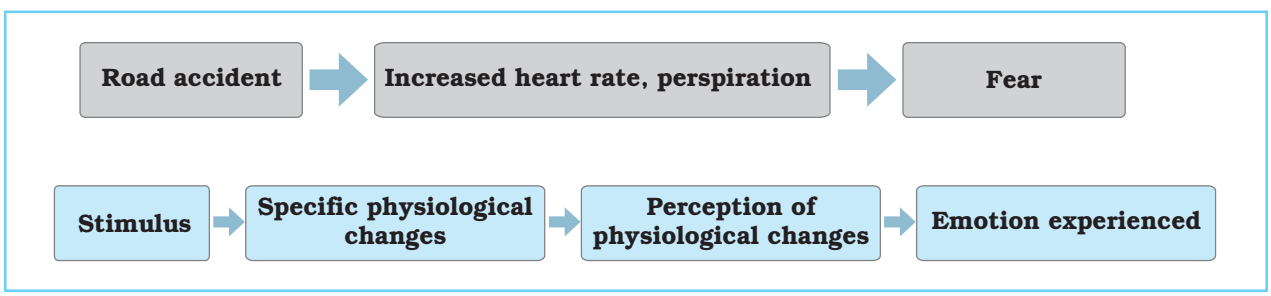

Fig.9.5 : James-Lange Theory of Emotion

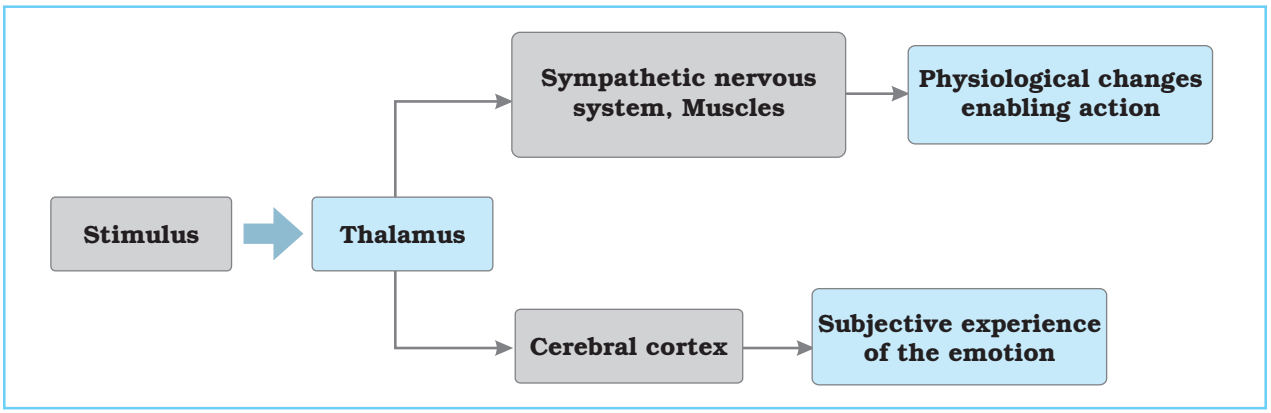

Fig.9.6 : Cannon-Bard Theory of Emotion

systems function together in a reciprocal manner. In a stressful situation the sympathetic system prepares the body to face the situation. It strengthens the internal environment of the individual by controlling the fall in heart rate, blood pressure, blood sugar, etc. It induces a state of physiological arousal that prepares the individual for fight or flight response in order to face the stressful situation. As the threat is removed the parasympathetic system gets active and restores the balance by calming the body. It restores and conserves energy and brings the individual back to a normal state.

Though acting in an antagonistic manner, the sympathetic and parasympathetic systems are complementary to each other in completing the process of experience and expression of emotion.

Cognitive Bases of Emotions

Most psychologists today believe that our cognitions, i.e. our perceptions, memories, interpretations are essential ingredients of emotions. Stanley Schachter and Jerome Singer have proposed a two-factor theory in which emotions have two ingredients: physical arousal and a cognitive label. They presumed that our experience of emotion grows from our awareness of our present arousal. They also believed that emotions are physiologically similar. For example, your

Box 9.3 Lie Detection

Lie detectors are also called polygraphs because they graphically record several bodily reactions simultaneously which measure the bodily arousal of the individual. Typically a lie detector measures changes in blood pressure, heart rate, breathing rate and depth, and the Galvanic Skin Response (GSR) which indicates variations in the electrical conductivity of the skin.

The individual being tested is first asked a series of neutral (control) questions to establish the baseline. Simple questions are followed by specific questions that are designed to evoke responses from a guilty knowledge supposedly indicating the individual's involvement in the crime being investigated. The lie detector or the polygraph records the changes in neurophysiological activities that occur while the suspected individual answers these questions.

Though the polygraph makes several objective recordings, the interpretation of these records relies heavily on the subjective judgment by the examiner. It is also probable that several unrelated factors like fear, pain or anxiety being felt by the individual during the test may affect her/his level of arousal. It is possible for the individual to lie with it. The validity of polygraph results is doubtful; however these are still used by law-enforcing agencies for lie detection.

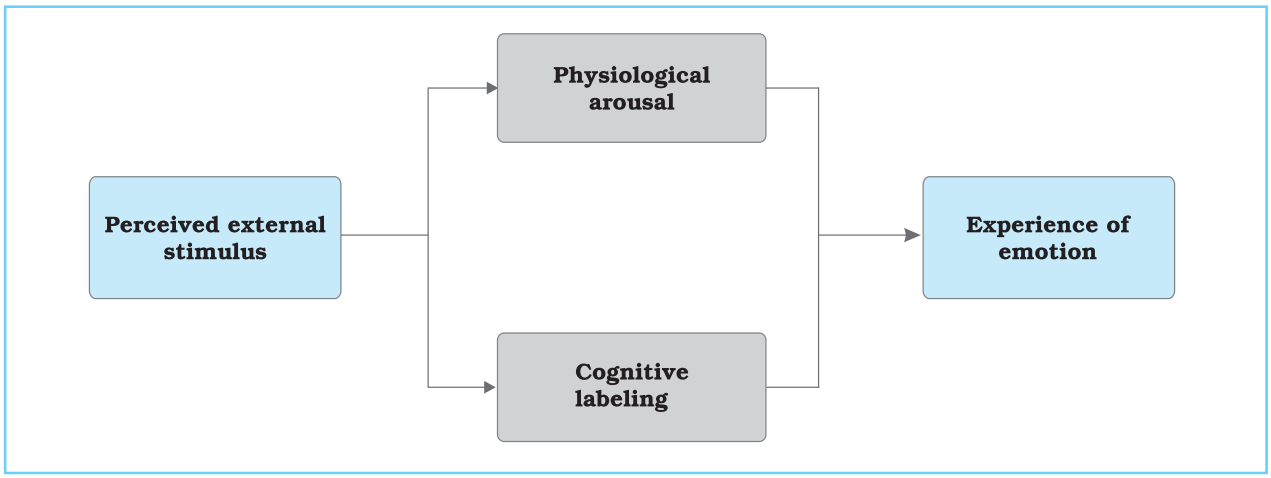

Fig.9.7 : Schachter-Singer Theory of Emotion

heart beats faster when you are excited or scared or angry. You are physiologically aroused and look to the external world for explanation. Thus, in their view an emotional experience requires a conscious interpretation of the arousal.

If you are aroused after physical exercise and someone teases you, the arousal already caused by the exercise may lead to provocation. To test this theory, Schachter and Singer (1962) injected subjects with epinephrine, a drug that produces high arousal. Then these subjects were made to observe the behaviour of others, either in an euphoric manner (i.e. shooting papers at a waste basket) or in an angry manner (i.e. stomping out of the room). As predicted, the euphoric and angry behaviour of others influenced the cognitive interpretation of the subjects' own arousal.

Cultural Bases of Emotions

Till now we have been discussing the physiological and the cognitive bases of emotions. This section will examine the role of culture in emotions. Studies have revealed that the most basic emotions are inborn and do not have to be learned. Psychologists largely have a notion that emotions, especially facial expressions, have strong biological ties. For example, children who are visually impaired from birth and have never observed the smile or seen another person's face, still smile or frown in the same way that children with normal vision do.

But on comparing different cultures we see that learning plays an important role in emotions. This happens in two ways. First, cultural learning influences the expression of emotions more than what is experienced, for example, some cultures encourage free emotional expression, whereas other cultures teach people, through modeling and reinforcement, to reveal little of their emotions in public.

Second, learning has a great deal to do with the stimuli that produce emotional reactions. It has been shown that individuals with excessive fears (phobia) of elevators, automobiles, and the like learnt these fears through modeling, classical conditioning or avoidance conditioning.

Expression of Emotions

Do you get to know that your friend is happy or sad or indifferent? Does s/he understand your feelings? Emotion is an internal experience not directly observable by others. Emotions are inferred from verbal and non-verbal expressions. These verbal and non-verbal expressions act as the channels of communication and enable an individual to express one's emotions and to understand the feelings of others.

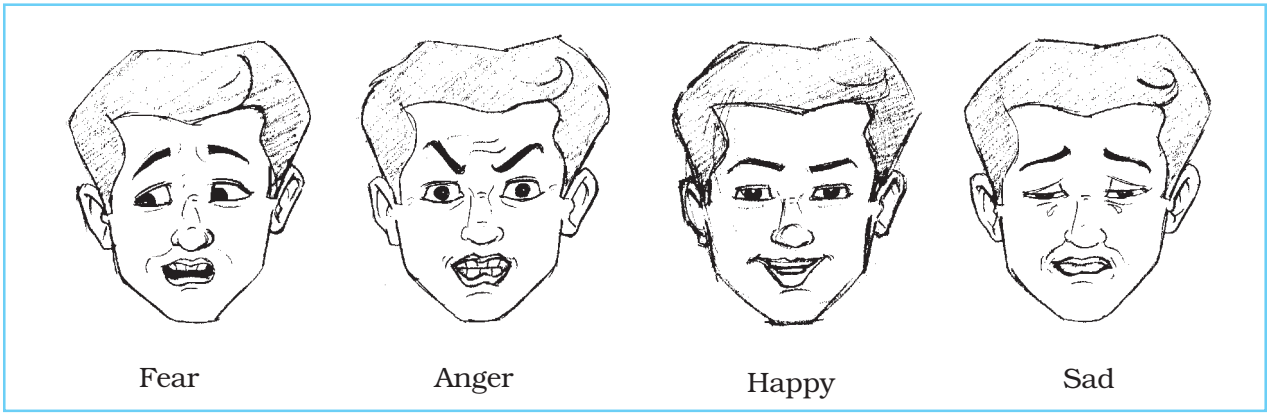

Fig.9.8 : Sketches of Facial Expressions of Emotions

Culture and Emotional Expression

The verbal channel of communication is composed of spoken words as well as other vocal features of speech like pitch and loudness of the voice. These non-verbal aspects of the voice and temporal characteristics of speech are called 'paralanguage'. Other non-verbal channels include facial expression, kinetic (gesture, posture, movement of the body) and proximal (physical distance during face-to-face interaction) behaviours. Facial expression is the most common channel of emotional communication. The amount and kind of information conveyed by the face is easy to comprehend as the face is exposed to the full view of others (see Fig.9.8). Facial expressions can convey the intensity as well as the pleasantness or unpleasantness of the individual's emotional state. Facial expressions play an important role in our everyday lives. There has been some research evidence supporting Darwin's view that facial expressions for **basic emotions** (joy, fear, anger, disgust, sadness, and surprise) are inborn and universal.

Bodily movements further facilitate the communication of emotions. Can you feel the difference between your body movements when you feel angry and movements when you feel shy? Theatre and drama provide an excellent opportunity to understand the impact of body movements in communicating emotions. The roles of gestures and proximal behaviours are also significant. You must have seen how in Indian classical dances like *Bharatanatyam, Odissi, Kuchipudi, Kathak* and others, emotions are expressed with the help of movements of eyes, legs, and fingers. The dancers are trained rigorously in the grammar of body movement and non-verbal communication to express joy, sorrow, love, anger, and various other forms of emotional states.

The processes involved in emotions have been known to be influenced by culture. Current research has dealt more specifically with the issue of universality or culture specificity of emotions. Most of this research has been carried out on the facial expression of emotions as the face is open to easy observation, is relatively free from complexity and provides a link between subjective experience and overt expression of an emotion. Still it must be emphasised that emotions are conveyed not only via face. A felt emotion may be communicated through other non-verbal channels as well, for example, gaze behaviour, gestures, paralanguage, and proximal behaviour. The emotional meaning conveyed via gestures (body language) varies from culture to culture. For example, in China, a handclap is an expression of worry or disappointment, and anger is expressed with laughter. Silence has also been found to convey different meanings for different cultures. For example, in India, deep emotions are sometimes communicated via silence. This

may convey embarrassment during communication in Western countries. Cultural differences have also been found in the gaze behaviour. It has been observed that the Latin Americans and the Southern Europeans direct their gaze to the eyes of the interactant. Asians, in particular, Indians and Pakistanis, prefer a peripheral gaze (looking away from the conversational partner) during an interaction. The physical space (proximity) also divulges different kinds of emotional meaning during emotional exchanges. The Americans, for example, do not prefer an interaction too close; the Oriental Indians consider a close space comfortable for an interaction. In fact, the touching behaviour in physical proximity is considered reflective of emotional warmth. For example, it was observed that the Arabs experience alienation during an interaction with the North Americans who prefer to be interacted from outside the olfactory (too close) zone.

Activity 9.3

Emotional expressions vary in their intensity as well as variety. In your spare time, try collecting from old magazines or newspapers as many pictures of different individuals expressing various emotions. Make picture cards pasting each photograph on a piece of cardboard and number them. You can make a set of such cards that represent different emotional expressions. Involve a group of your friends in the activity. Display these cards one by one to your friends and ask them to identify the emotions being portrayed. Note down the responses and notice how your friends differ from each other in labelling the same emotion. You can also try to categorise the pictures using categories like positive and negative, intense and subtle emotions, and so on. Try to notice how people differ from each other in expressing the same emotion. What could be the reason for such differences? Discuss in class.

Culture and Emotional Labeling

Basic emotions also vary in the extent of elaboration and categorical labels. The Tahitian language includes 46 labels for the English word *anger*. When asked to label freely, the North American subjects produced 40 different responses for the facial expression of anger and 81 different responses for the facial expression of contempt. The Japanese produced varied emotional labels for facial expressions of happiness (10 labels), anger (8 labels), and disgust (6 labels). Ancient Chinese literature cites seven emotions, namely, joy, anger, sadness, fear, love, dislike, and liking. Ancient Indian literature identifies eight such emotions, namely, love, mirth, energy, wonder, anger, grief, disgust, and fear. In Western literature, certain emotions like happiness, sadness, fear, anger, and disgust are uniformly treated as basic to human beings. Emotions like surprise, contempt, shame, and guilt are not accepted as basic to all.

In brief, it might be said that there are certain basic emotions that are expressed and understood by all despite their cultural and ethnic differences, and there are certain others that are specific to a particular culture. Again, it is important to remember that culture plays a significant role in all processes of emotion. Both expression and experience of emotions are mediated and modified by culture specific '*display rules*' that delimit the conditions under which an emotion may be expressed and the intensity with which it is displayed.

Managing Negative Emotions

Try living a day in which you do not feel any emotion. You would realise that it is difficult even to imagine a life without emotions. Emotions are a part of our daily life and existence. They form the very fabric of our life and interpersonal relations.

Emotions exist on a continuum. There are various intensities of an emotion that can be experienced by us. You can experience extreme elation or slight happiness, severe grief or just pensiveness. However, most of us usually maintain a balance of emotions.

When faced with a conflicting situation, individuals attempt to adjust and derive a coping mechanism either with task or defense-oriented reactions. These coping patterns help them prevent abnormal emotional reactions

such as anxiety, depression etc. **Anxiety** is a condition that an individual develops in case of failure to adopt an appropriate ego defense. For example, if the individual fails to adhere to a defense of rationalisation for his immoral act (like cheating or stealing), he may develop intense apprehension about the outcomes of such an act. Anxious individuals find it difficult to concentrate or to make decisions even for trivial matters.

The state of depression affects an individual's ability to think rationally, feel realistically, and work effectively. The condition overwhelms the mood state of the individual. Because of its enduring nature, the individual who suffers from depression develops a variety of symptoms like difficulty in falling asleep, increased level of psychomotor agitation or retardation, decreased ability to think or concentrate, and loss of interest in personal or social activities, etc.

In daily life, we are often faced with conflicting situations. Under demanding and stressful conditions, a lot of negative emotions like fear, anxiety, disgust, etc. develop in an individual to a considerable extent. Such negative emotions, if allowed to prevail for a long time, are likely to affect adversely the person's psychological and physical health. This is the reason why most of the stress management programmes emphasise emotion management as an integral part of stress management. The major focus of emotion management techniques is the *reduction of negative emotions and enhancing positive emotions.*

Though most researchers focus their attention only on negative emotions like anger, fear, anxiety, etc., recently the field of 'Positive Psychology' has gained much prominence. As the name suggests, positive psychology concerns itself with the study of features that enrich life like, hope, happiness, creativity, courage, optimism, cheerfulness, etc.

Effective emotion management is the key to effective social functioning in modern times. The following tips might prove useful to you for achieving the desired balance of emotions :

- **Enhance self-awareness** : Be aware of your own emotions and feelings. Try to gain insight into the 'how' and 'why' of your feelings.
- **Appraise the situation objectively** : It has been proposed that emotion is preceded by evaluation of the event. If the event is experienced as disturbing, your sympathetic nervous system is activated and you feel stressed. If you do not experience the event as disturbing, then there is no stress. Hence, it is you who decides whether to feel sad and anxious or happy and relaxed.
- **Do some self-monitoring** : This involves constant or periodic evaluation of your past accomplishments, emotional and physical states, real and vicarious experiences. A positive appraisal would enhance your

Box 9.4 Post-Traumatic Stress Disorder

A disaster produces serious disruption of the functioning of human society, resulting in widespread material or environmental loss, which cannot be dealt with immediately with the existing resources. Disaster may be natural (like earthquake/cyclone/tsunami) or man-made (like war). The trauma an individual experiences during a disaster may range from mere perception of such an event to actually encountering it, which may be life threatening. Either of these conditions may lead to development of post-traumatic stress disorder (PTSD), where the person tends to re-experience the event through flashbacks and get overwhelming thoughts about the event even after a substantial period of time. This condition makes a person emotionally disturbed and the person fails to adopt an appropriate coping strategy in regular activities. Emotions manifest in uniquely recognisable patterns with maladaptive behaviour (like depression) and autonomic arousal.

faith in yourself and lead to enhanced feeling of wellness and contentment.

- **Engage in self-modeling** : Be the ideal for yourself. Repeatedly observe the best parts of your past performance and use them as an inspiration and motivation to perform better in the future.
- **Perceptual reorganisation and cognitive restructuring** : Try viewing the events differently and visualise the other side of the coin. Restructure your thoughts to enhance positive and reassuring feelings and eliminate negative thoughts.
- **Be creative** : Find and develop an interest or a hobby. Engage in an activity that interests and amuses you.
- **Develop and nurture good relationships** : Choose your friends carefully. In the company of happy and cheerful friends you will feel happy in general.
- **Have empathy** : Try understanding other's feelings too. Make your relationships meaningful and valuable. Seek as well as provide support mutually.
- **Participate in community service** : Help yourself by helping others. By doing

Box 9.5 Management of Examination Anxiety

For most of us an approaching examination brings about a feeling of a churning stomach and anxiety. In fact, any situation which involves performing a task and the awareness of being evaluated for the performance is an anxiety-provoking situation for most people. A certain level of anxiety is definitely essential as it motivates and pushes us to put up our best performance but a high level of anxiety becomes an impediment in optimum performance and achievement. An anxious individual is highly aroused physiologically and emotionally, and hence is not able to perform to the best of her/his abilities.

An examination is a potentially stress provoking situation and like other stressful situations coping involves two strategies, i.e. Monitoring or taking effective action, and Blunting or avoiding the situation.

Monitoring involves taking effective and direct action to deal with the stressful situation. The following strategies can be used for monitoring :

- ***Prepare well*** *: Prepare well for the examination and prepare well in advance. Give yourself ample time. Familiarise yourself with the pattern of question papers and frequently asked questions. This gives you a sense of predictability and control and reduces the stress potential of the examination.*
- ***Have a rehearsal*** *: Make yourself go through a mock examination. Ask your friend to test your knowledge. You can also rehearse mentally in your mind. Visualise yourself taking the examination completely relaxed and confident and then passing with flying colours.*
- ***Inoculation*** *: Inoculate yourself against stress. Exposure through rehearsals and role-playing prepares you physically and mentally to face the examination situation better and with confidence.*
- ***Positive thinking*** *: Have faith in yourself. Structure your thoughts with systematically listing the thoughts that worry you and then rationally dealing with them one by one. Emphasise on your strengths. Suggest to yourself to be positive and enthusiastic.*
- ***Seek support*** *: Do not hesitate to ask for help from your friends, parents, teachers or seniors. Talking about a stressful situation to a close person makes one feel light and helps gain insight. The situation may not be as bad as it seems.*

On the other hand, blunting strategies involve avoiding the stressful situation. True, avoidance is neither desirable nor possible in an examination situation, but the following techniques may prove useful:

- ***Relaxation*** *: Learn to relax. Relaxation techniques help you calm your nerves and give you an opportunity to reframe your thoughts. There are many different relaxation techniques. In general, this involves sitting or lying down in a comfortable posture in a quiet place, relaxing your muscles, reducing the external stimulation as well as minimising the flow of thoughts and focusing.*
- ***Exercise*** *: A stressful situation overactivates the sympathetic nervous system. Exercise helps in channelising the excess energy generated by this. A brief period of light exercise or active sport will help you concentrate better on your studies.*

community service (for example, helping an intellectually challenged child learn an adaptive skill), you will gain important insights about your own difficulties.

Activity 9.4

Think of an intense emotional experience you have gone through recently and explain the sequence of events. How did you deal with it? Share it with your class.

Managing your Anger

Anger is a negative emotion. It carries the mind away or in other words, the person looses control on behavioural functions during the state of anger. The major source of anger is the frustration of motives. However, anger is not a reflex, rather it is a result of our thinking. Neither is it automatic nor uncontrollable and caused by others but it is a self-induced choice that the individual makes. Anger is a result of your thinking and hence is controllable by your own thoughts only. Certain key points in anger management are as follows:

- Recognise the power of your thoughts.
- Realise you alone can control it.
- Do not engage in 'self-talk that burns'. Do not magnify negative feelings.
- Do not ascribe intentions and ulterior motives to others.
- Resist having irrational beliefs about people and events.
- Try to find constructive ways of expressing your anger. Have control on the degree and duration of anger that you choose to express.
- Look inward not outward for anger control.
- Give yourself time to change. It takes time and effort to change a habit.

Enhancing Positive Emotions

Our emotions have a purpose. They help us adapt to the ever-changing environment and are important for our survival and well-being. Negative emotions like fear, anger or disgust prepare us mentally and physically for taking immediate action towards the stimulus that is threatening. For example, if there was no fear we would have caught a poisonous snake in our hand. Though negative emotions protect us in such situations but excessive or inappropriate use of these emotions can become life threatening to us, as it can harm our immune system and have serious consequences for our health.

Positive emotions such as hope, joy, optimism, contentment, and gratitude energise us and enhance our sense of

Box 9.6 Emotional Intelligence

Expressions of emotion depend on regulation of emotion for self or others. Persons who are capable of having awareness of emotions for self or others and regulate accordingly are called emotionally intelligent. Persons who fail to do so, deviate and thereby develop abreaction of emotion, resulting in psychopathology of certain kinds.

By emotional intelligence, we understand 'the ability to monitor one's own and other's emotions, to discriminate among them and to use the information to guide one's thinking and actions' (Mayer & Salovey, 1999). The concept of emotional intelligence subsumes intrapersonal and interpersonal elements. The intrapersonal element includes factors like self-awareness (ability to keep negative emotions and impulses under control), and self-motivation (the drive to achieve despite setbacks, developing skills to attain targets and taking initiative to act on opportunities). The interpersonal element of emotional intelligence includes two components: social awareness (the awareness and the tendency to appreciate other's feelings) and social competence (social skills that help to adjust with others, such as team building, conflict management, skills of communicating, etc.).

emotional well-being. When we experience positive affect, we display a greater preference for a large variety of actions and ideas. We can think of more possibilities and options to solve whatever problems we face and thus, we become proactive.

Psychologists have found that people, who were shown films depicting joy and contentment, came up with more ideas regarding things they would like to do as compared to those who were shown films evoking anger and fear. Positive emotions give us a greater ability to cope with adverse circumstances and quickly return to a normal state. They help us set up long-term plans and goals, and form new relationships. Various ways of enhancing positive emotions are given below:

- **Personality traits** of optimism, hopefulness, happiness and a positive self-regard.
- Finding **positive meaning** in dire circumstances.
- Having **quality connections** with others, and supportive network of close relationships.
- **Being engaged** in work and gaining mastery.
- A **faith** that embodies social support, purpose and hope, leading a life of purpose.
- **Positive interpretations** of most daily events.

Key Terms

Amygdala, Anxiety, Arousal, Autonomic nervous system, Basic emotions, Biological needs (hunger, thirst, sex), Central nervous system, Conflict, Emotional intelligence, Esteem needs, Examination anxiety, Expression of emotions, Frustration, Hierarchy of needs, Motivation, Motives, Need, Power motive, Psychosocial motives, Self-actualisation, Self-esteem

Summary

- *The process of persistent behaviour directed towards a specific goal, which results from certain driving forces, is called motivation.*
- *There are two types of motivation, namely, biological, and psychosocial motivation.*
- *Biological motivation focuses on the innate, biological causes of motivation like hormones, neurotransmitters, brain structures (hypothalamus, limbic system), etc. Examples of biological motivation are hunger, thirst, and sex.*
- *Psychosocial motivation explains motives resulting mainly from the interaction of the individual with his social environment. Examples of psychosocial motives are need for affiliation, need for achievement, curiosity and exploration, and the need for power.*
- *Maslow arranged various human needs in an ascending hierarchical order, beginning with the most basic physiological needs, and then safety needs, love and belongingness needs, esteem needs, and finally on the top of the hierarchy is the need for self-actualisation.*
- *Other concepts related to motivation are frustration and conflicts.*
- *Emotion is a complex pattern of arousal that involves physiological activation, conscious awareness of feeling, and a specific cognitive label that describes the process.*
- *Certain emotions are basic like joy, anger, sorrow, surprise, fear, etc. Other emotions are experienced as a result of combination of these emotions.*
- *Central and autonomic nervous system play a major role in regulating emotions.*
- *Culture strongly influences the expression and interpretation of emotions.*
- *Emotion is expressed through verbal and non-verbal channels.*
- *It is important to manage emotions effectively in order to ensure physical and psychological well-being.*

Review Questions

1. Explain the concept of motivation.
2. What are the biological bases of hunger and thirst needs?
3. How do the needs for achievement, affiliation, and power influence the behaviour of adolescents? Explain with examples.
4. What is the basic idea behind Maslow's hierarchy of needs? Explain with suitable examples.
5. Does physiological arousal precede or follow an emotional experience? Explain.
6. Is it important to consciously interpret and label emotions in order to explain them? Discuss giving suitable examples.
7. How does culture influence the expression of emotions?
8. Why is it important to manage negative emotions? Suggest ways to manage negative emotions.

Project Ideas

1. Using Maslow's hierarchy of needs, analyse what kind of motivational forces might have motivated the great mathematician S.A. Ramanujan and the great shehnai Maestro Ustad Bismillah Khan (Bharat Ratna) to perform exceptionally in their respective fields. Now place yourself and five more known people in terms of need satisfaction. Reflect and discuss.
2. In many households, family members do not eat without bathing first and practise religious fasts. How have different social practices influenced your expression of hunger and thirst? Conduct a survey on five people from different backgrounds and prepare a report.

GLOSSARY

Absolute threshold: The minimum intensity necessary for a stimulus to be detected.

Accommodation: Visual action of the ciliary muscles to change the shape of the lens.

Acculturation: Cultural and psychological changes resulting from continuous, first-hand contact between two distinctive cultural groups.

Achievement need/motive: Need to succeed, to perform better than others, to excel, to take challenging tasks which demonstrate person's ability.

Acuity: The sharpness of vision.

Adolescence: The developmental period of transition from childhood to early adulthood, starting at approximately 11 to 12 years of age and ending at 18 to 20 years of age.

Adrenaline: A very vital hormone of the human body, which prepares one for fight, flight or fright response.

Adrenocorticotropic hormone (ACTH): A hormone secreted by the anterior pituitary gland that stimulates the adrenal to secrete its corticoid hormones.

Aerial perspective: A monocular cue to depth perception consisting of the relative clearness of objects under varying atmospheric conditions. Nearer objects are usually clearer in detail and colour whereas farther objects are less distinct.

Afferent neurons: Neurons involved in the process of sending information.

After images: A visual image that persists after a stimulus is removed.

All-or–none law: The rule that a neuron will always respond with its complete strength (action potential) to a stimulus or will not respond at all, regardless of the stimulus magnitude.

Amplitude: In sound waves, the distance from the baseline to the peak of each sincisoidal wave. In the EEG measurement, the distance from the maximal and minimal voltage in the EEG record. In either case, it is commonly used as a measure of intensity.

Amygdala: Two almond-shaped neural clusters that are components of the limbic system and are linked to emotion.

Animism: A facet of preoperational thought; the belief that inanimate objects have "lifelike" qualities and are capable of action.

Anxiety: A general feeling of apprehension or dread accompanied by predictable physiological changes.

Approach-approach conflict: Conflict characterising choice between two equally pleasurable or desirable goals.

Approach-avoidance conflict: Conflict caused by a situation that has both positive and negative aspects. The individual, who is both repulsed and attracted by the same goal, exhibits the feelings of ambivalence.

Arousal: A physiological state of the body.

Artificial intelligence (AI): The field concerned with creating machines (e.g., computers) that can perform complex tasks formerly considered to require human intelligence.

Associative learning: Learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning).

Attachment: A close emotional bond between the infant and the parents or caregiver.

Attribution: Inference about an individual's internal state based on the perception of external factors (cues).

Authoritative parenting: A parenting style in which parents encourage children to be independent but still place limits and control on their actions.

Autonomic nervous system: A division of the peripheral nervous system that regulates smooth muscle, i.e. organ and glandular activities; includes the sympathetic and parasympathetic nervous system important in emotional behaviour.

Avoidance-avoidance conflict: Conflict between two equally undesirable or fear-evoking goals; the solution is often escaped.

Axon: The part of the neuron that carries information away from the cell body to other neurons.

Basic emotions: Feeling states common to the human species from which other feeling states are derived.

Behaviour genetics: The study of the power and limits of genetic and environmental influences on behaviour.

Behaviour: Any covert or overt action/reaction a person or animal does that can be observed in some way.

Behaviourism: A school of thought that emphasises objectivity, observable behavioural responses, learning, and environmental determinants.

Bilingualism: The acquisition of two languages that use different speech sounds, vocabularies, and grammatical rules.

Binocular cues: Depth cues, such as retinal disparity and convergence, that depend on the use of two eyes.

Biofeedback: A procedure that permits individuals to monitor their own physiological processes (e.g., heart rate, blood pressure), which they are normally unaware of, to learn to control them.

Blind spot: The point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there.

Bottom-up processing: In form perception, progression from individual elements to the whole.

Brainstem: The oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull; it is responsible for automatic survival functions.

Brainstorming: A problem-solving strategy in which an individual or a group collects all possible ideas and evaluates them only after all ideas have been collected.

Brightness: The psychological experience associated with a light's intensity, or wave amplitude.

Cannon-Bard theory: A theory of emotion that holds that bodily changes and the experience of emotion occur simultaneously.

Case study: A technique in which one person is studied in depth.

Cell: The most fundamental unit of a living organism.

Central nervous system (CNS): Subsystem of the nervous system composed of brain and spinal cord.

Centration: The focusing or centring of attention on one characteristic to the exclusion of all others.

Cephalocaudal pattern: The sequence in which the greatest growth occurs at the top-the head-with physical growth in size, weight, and feature differentiation gradually working from top to bottom.

Cerebellum: Structure of the brain at the base of the skull, which organises bodily motion, posture, and equilibrium.

Cerebral cortex: Area of the brain that regulates the brain's higher cognitive and emotional functions.

Cerebral hemispheres: Two nearly symmetrical halves of the cerebral cortex.

Chromosomes: Threadlike structures that come in 23 pairs, one member of each pair coming from each parent. Chromosomes contain the remarkable genetic substance deoxyribonucleic acid (DNA).

Chronological age: The number of years that have elapsed since a person's birth; what is usually meant by "age".

Chunking: A group of familiar stimuli stored as a single unit.

Classical conditioning: A type of learning in which an organism learns to associate stimuli. The main feature is that the originally neutral conditioned stimulus (CS), through repeated pairing with the unconditioned stimulus (US), acquires the response originally given to the US.

Closure: Organisational process leading to perception of incomplete figures as wholes.

Cochlea: The fluid-filled, coiled tunnel in the inner ear that contains the receptors for hearing.

Cognition: All the mental activities associated with knowing; namely, perceiving, thinking, and remembering, etc. These are associated with processing, understanding, and communicating information.

Cognitive approach: The view that emphasises human thought and all the processes of knowing as central to the study of psychology.

Cognitive economy: A term to denote maximum and efficient use of the capacity of long-term memory through organisation of concepts in a hierarchical network.

Cognitive learning: Learning that involves reorganisation of one's perceptions, knowledge, and ideas.

Cognitive map: A mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it.

Cognitive processes: Processes involving the individual's thought, intelligence, and language.

Colour blindness: Having some degree of inability to perceive colour.

Colour constancy: The tendency to perceive a well-known object as being a single colour, even if its actual colour is modified by changes in illumination.

Concept: A general category of ideas, objects, people, or experiences whose members share certain properties.

Concrete operational stage: The third Piagetian stage, lasting approximately from 7 to 11 years

of age. In this stage, children can perform logical operations, and reasoning on concrete examples but cannot deal with abstract things.

Conditioned response (CR): In classical conditioning, the learned or acquired response to a conditioned stimulus (CS).

Conditioned stimulus (CS): A neutral stimulus that, through repeated association with an unconditioned stimulus, becomes capable of eliciting a conditioned response (CR).

Conditioning: A systematic procedure through which new responses are learned to stimuli.

Cones: Specialised visual receptors that play a key role in daylight vision and color vision.

Confidentiality: Researchers are responsible for keeping all of the data they collect completely anonymous.

Conflict: A state of disturbance or tension resulting from opposing motives, drives, needs, or goals.

Confounding: A term used to describe the operation of variables in an experiment that confuse the interpretation of the data. If the independent variable is confounded with an uncontrolled relevant variable, the experimenter cannot separate the effects of the two variables on the dependent measure.

Consciousness: Awareness of the general condition of one's mind, awareness of particular mental contents, or self-awareness.

Conservation: A belief in the permanence of certain attributes of objects or situations in spite of superficial changes.

Content analysis: A procedure for analysing the themes in qualitative data by determining the frequency of specific ideas, concepts, or terms and their relationship.

Control group: Subjects in a study who do not receive the special treatment given to the experimental group.

Control processes: Mechanisms which govern transfer of information from one system of storage to another.

Convergent thinking: Thinking that is directed toward one correct solution to a problem.

Corpus callosum: A bundle of neural fibers connecting the two brain hemispheres and carrying messages between them.

Correlational research: Research with the goal of describing the strength of the relationship between two or more events or characteristics or variables.

Cortex: The greyish, thin, unmyelinated covering of the cerebrum.

Creativity: The ability to think in novel and unusual ways and to come up with unique solutions to problems.

Culture: The widely shared customs, beliefs, values, norms, institutions, and other products of a community that are transmitted socially across generations.

Dark adaptation: The process in which the eyes become more sensitive to light in low illumination.

Data: Qualitative and quantitative information related to mental processes and behaviour, gathered from individuals.

Debriefing: The procedure for informing a participant of the actual intent of an experiment after its successful completion. It is specially required if the participant was seriously misled during the conduct of experiment.

Decision-making: The process of evaluating alternatives and making choices among them.

Deductive reasoning: Reaching a conclusion by accepting the premises of an argument and then following the formal logical rules.

Deoxyribonucleic acid (DNA): The genetic material of the cell, located in the nucleus.

Dependent variable: The factor that is measured in an experiment; it changes because of the manipulation of the independent variable.

Depth perception: The perception of the distance of an object from the observer or the distance from front to back of a solid object.

Development: It is the pattern of progressive, orderly, and predictable changes that begin at conception and continue throughout life.

Difference threshold: The minimum difference between a pair of stimuli that can be perceived.

Discrimination: In classical conditioning, the ability to distinguish between a conditioned stimulus and other stimuli that do not signal an unconditioned stimulus. In operant conditioning, responding differently to stimuli that signal a behaviour will be reinforced or will not be reinforced.

Divergent thinking: Thinking that meets the criteria of originality, inventiveness, and flexibility. It calls for thinking in different directions, searching for a variety of answers to questions that can have several answers and is characteristic of creativity.

Divided attention: The process by which attention is split between two or more sets of stimuli.

Dual-coding theory: Paivio's theory that memory is enhanced by forming semantic and visual codes, since either can lead to recall.

Dyslexia: A general term referring to difficulty in reading.

Echoic memory: A momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds.

Efferent neurons: Conducting or conveying (nervous system impulses) away from the central nervous system and toward effecter units in muscles or glands.

Egocentrism: A salient feature of pre-operational thought, which refers to the inability to distinguish between one's own perspective and someone else's perspective.

Elaborative rehearsals: The linking of new information in short-term memory to familiar material stored in long-term memory.

Emotion: Complex pattern of changes in response to situation perceived as personally significant, including physiological arousal, feelings, thoughts, and behaviours.

Emotional intelligence: The set of skills that underlie the accurate assessment, evaluation, expression, and regulation of emotions.

Encephalisation: The tendency for greater elaborations of the nervous system across evolutionary development to be directed towards the head end of the organism.

Encoding: The process of recording information into the memory system for the first time.

Endocrine glands: The glands, which secrete their hormones directly into the bloodstream.

Environment: The aggregate of external conditions – physical, biological, social and cultural that influence the functions of the organism.

Episodic memory: LTM component that stores autobiographic information coded for reference to a timeframe for past occurrences.

Esteem needs: In Maslow's theory, needs for prestige, success, and self-respect. They can be fulfilled after belongingness and love needs are satisfied.

Eustachian tube: Passage that connects the middle ear to the throat and allows release of pressure.

Evolution: The theory proposed by Charles Darwin that over time organisms originate and change in response to adaptational demands of their unique environments.

Experiment: A series of observations conducted under controlled conditions to investigate the causal relationship between selected variables.

Experimental group: The subjects in study who receive some special treatment in regard to the independent variable.

Explicit memory: Memory of facts and experiences that one can consciously know and "declare" (also called declarative memory).

Extinction: The diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus (US) does not follow a conditioned stimulus (CS); occurs in operant conditioning when a response is no longer reinforced.

Feedback: Information regarding performance on a learning task; also called knowledge of results.

Field experiment: An experiment carried out in a natural "real world" setting in which variables are manipulated in some manner and observed for their reactions.

Fight or flight syndrome: It is an acute reaction to stress in which an individual reacts to stimulus by fighting against stress or runs away from stressful stimulus.

Fine motor skills: Motor skills that involve more finely tuned movements, such as finger dexterity.

Formal operational stage: The fourth Piagetian stage in which the individuals move beyond the world of actual or concrete experiences and think in abstract and more logical terms.

Free recall: In memory experiments, retrieval of stored items in any order by the participant.

Frontal lobe: The portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments.

Frustration: State assumed to exist when goal-directed activity is blocked in some manner.

Fugue state: Amnesia accompanied by actual physical flight — the person may wander away for several hours or move to another area and establish a new life.

Functional fixedness: The tendency to think of things only in terms of their usual functions, an impediment to problem solving.

Functionalism: The school of psychology that emphasised the utilitarian, adaptive functions of the human mind or consciousness.

Galvanic skin response (GSR): Changes in electrical conductivity of, or activity in, the skin, detected by a sensitive galvanometer.

Gender: The social dimension of being male or female.

Gender identity: The sense of being male or female, which most children acquire by the time, they are 3 years old.

Gender role: A set of expectations that prescribe how females and males should think, act and feel.

Generalisation: The tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to evoke similar responses.

Genes: The units of hereditary information, short chromosome segments composed of DNA. Genes act as blueprints for cells to reproduce themselves and manufacture the proteins that maintain life.

Gestalt: An organised whole, Gestalt psychologists emphasise our tendency to integrate pieces of information into meaningful wholes.

Gestalt psychology: A branch of psychology in which behaviour is viewed as an integrated whole, greater than the sum of its parts.

Grammar: Is the set of rules indicating how the elements of language may be combined to make intelligible sentences.

Gross motor skills: Motor skills that involve large muscle activities, such as walking.

Group test: A test administered to several people at one time by a single tester.

Hemispheres: The symmetrical halves of the cerebrum or cerebellum.

Hemispheric dominance: Refers to control of key motor and cognitive functions by one hemisphere, generally the left hemisphere

Heredity: The biological transmission of traits from parents to offspring.

Hierarchy of needs: Maslow's pyramid represents motivational needs in a hierarchy. The more basic needs, such as physiological and safety needs, are at the bottom followed by the higher-level needs, such as love, and esteem, and self-actualisation at the top. To move up the hierarchy, a person must have the basic physiological needs met first.

Homeostasis: The physiological tendency to maintain an internal, bodily state of balance in terms of food, water, air, sleep, and temperature.

Homo sapiens: The scientific nomenclature of modern human beings.

Hormones: Chemical substances secreted by glands into the bloodstream.

Hue: Colour.

Humanistic psychology: The approach to psychology that emphasises the person, or the self, and personal growth and development.

Hypothalamus: A neural structure located just below the thalamus; it includes centers that govern motivated behaviour such as eating, drinking, sex, and emotions; it also regulates endocrine activity and maintains body homeostasis.

Hypothesis: A tentative statement of the relationship between variables as answer to the research question.

Identification: The process of associating one's self closely with other persons and assuming their characteristics or views.

Identity vs role confusion: Erikson's psychosocial developmental stage in which adolescents are faced with conflicts as who they are, what they are all about, and where they are going in life, resolution to these leads to identity formation.

Illumination: A stage in the creative process. The idea, solution, or new relationship emerges and all the facts fall into place.

Incidental learning: Learning that is not deliberate, or intentional and which is acquired as a result of some other possibly unrelated, activity.

Incubation: A stage in the creative process. The progress is not apparent at conscious level, the unconscious mind may work on any idea or solution.

Independent variable: The event or situation manipulated by an experimenter to see if it will have a predicted effect on some other event or situation.

Individual test: A test which can be administered to only one person at a time. The Stanford-Binet and the Wechsler intelligence tests are examples of individual tests.

Inductive reasoning: The logical process by which general principles are inferred from particular instances.

Infancy: The developmental period extending from birth to 24 months.

Information-processing approach: An approach concerned with how individuals process information about their world, how information enters our minds, how it is stored and transformed, and how it is retrieved to perform problem solving and reasoning.

Informed consent: Agreement to an experimental or therapeutic procedure on the basis of the subject's or patient's understanding of its nature and possible risks.

Initiative vs guilt: Erikson's stage of development in which pre-school children face a widening social world and are faced with the challenge of developing purposeful behaviour to cope with challenges, failure to which leads to development of guilt and shame.

Insight: The ability to deal effectively with novel situations.

Instinct: A complex universal behaviour that is rigidly patterned throughout a species and is unlearned.

Integrity vs despair: Erikson's eighth and last developmental stage during which individuals look back to evaluate what they have done with their lives, satisfaction leads to sense of integrity and dissatisfaction to despair.

Interference: In learning theory, the activities of the learner, either before, after, or during the learning process interfere with learned material, that cause forgetting.

Interposition: A depth perception cue based on the principle that if one object seems to be covering another, it will be perceived as being closer.

Interview: A face-to-face dialogue for the purpose of obtaining information, establishing a diagnosis, assessing interpersonal behaviour and personality characteristics, or counselling the individual.

Intrinsic motivation: The internal desire to be competent and to do something for its own sake.

Introspection: The process of looking inward to one's feelings and conscious experience.

James-Lange theory: A theory of emotion that holds that body's reaction to a stimulus produces emotional perception; the overt feeling of emotion is a result of the bodily changes.

Judgment: Process of forming opinions, reaching conclusions, and making evaluations based on available material; the product of the evaluation process.

Juvenile delinquency: A variety of adolescent behaviours ranging from socially unacceptable behaviour to status offenses (such as running away) to criminal offenses (such as theft).

Language: A set of symbols that convey meaning, and rules for combining those symbols, that can be used to generate an infinite variety of messages.

Law of proximity: Grouping law that asserts that nearest stimuli are grouped together.

Law of similarity: Grouping law that asserts that stimuli are grouped together on the basis of common elements.

Learning disabilities: Children with learning disabilities (1) are of normal intelligence or above, (2) have difficulties in several academic areas but usually do not show deficits in others, and (3) are not suffering from some other conditions or disorders that could explain their learning problems.

Learning: A relatively permanent change in an organism's behaviour due to experience.

Lie detector: An instrument whose use is based on the idea that lying is often accompanied by the visceral components of fear or excitement; the detector indicates when a person's answers are accompanied by emotional arousal.

Light adaptation: The adjustment of the rods and cones in the eye to changes in illumination.

Limbic system: Brain system that processes motivated behaviour, emotional states, and certain kinds of memory.

Linear perspective: A monocular cue for perceiving distance; we perceive the converging of what we know to be parallel lines as indicating increasing distance.

Loudness: The perception of a sound wave's amplitude.

Maintenance rehearsal: Active repetition of information to enhance subsequent access to it.

Maturation: The orderly sequence of changes dictated by each person's genetic blueprint.

Medulla: The base of the brainstem; controls heartbeat and breathing, waking, sleeping; Nerve fibers connecting the brain and the body cross over at the medulla.

Memes: Are the DNA of human society, influencing every aspect of mind, behaviour and culture.

Menarche: The first occurrence of menstruation.

Mental representation: A mental model of a stimulus or category of stimuli.

Mental set: Tendency to respond to a new problem/situation in the manner used for a previous one.

Metacognition: Knowledge and understanding of one's own mental processes.

Mind: Mind is a concept, which refers to unique set of individual's sensations, perceptions, memories, thoughts, dreams, motives and emotional feelings.

Mnemonics: Strategies or techniques that use familiar associations in storing new information to be more easily retrieved.

Modeling: In social learning theory, the process by which a child learns social and cognitive behaviours by observing and imitating others.

Monocular cues: Visual cues from one eye only.

Moral development: Development with respect to rules and conventions about what people should do in their interaction with other people/ situations.

Morphemes: The smallest units of meaning in a language.

Motivation: A need or desire that energises and directs behaviour.

Motives: The factors that direct and energise behaviour.

Motor development: The progression of muscular coordination required for physical activities.

Motor neurons: Neurons that carry impulses away from the CNS to muscles and glands.

Natural selection: The evolutionary process that favors individuals of a species that is best adapted to survive and reproduce.

Need: Physiological (internal) or environmental (external) imbalance or deficit that gives rise to a drive.

Negative correlation: Relationship between two variables in which as one variable goes up, the other goes down.

Negative reinforcer: An unpleasant stimulus whose removal leads to an increase in the probability that a preceding response will occur again in the future.

Nerve impulse: It is the passage of nerve sensation from one place to another, through electrochemical process of conduction in the nerve.

Nervous system: A massive network of nerve cells that relays messages to and from the brain.

Neuro psychology: It is the scientific study of behaviour and mental processes as function of brain activity and the nervous system.

Neuron: Nerve cell specialised to receive, process, and/or transmit information to other cells within the body.

Neurotic disorder: A psychological disorder that is usually distressing but that allows one to think rationally and function socially. Freud saw the neurotic disorders as ways of dealing with anxiety.

Neurotransmitters: Chemical messengers that relay messages to and from the brain.

Norm: Standard or value, based on measurements of a large group of people, used in interpreting scores on psychological tests; in social psychology, the group standard for approved behaviour.

Nucleus: A ganglion, or clump of nerve cells in the central nervous system.

Null hypothesis: A prediction that an experiment will find no difference between conditions or no relationship between variables.

Object permanence: Understanding that objects and events continue to exist even when they cannot directly be seen, heard, or touched.

Observation: The intentional examination and recording of an object or process as it occurs.

Operant conditioning: A form of learning in which voluntary responses come to be controlled by their consequences.

Operationism: The viewpoint that each concept must take its meaning as a single observable and measurable operation.

Operations: Internalised sets of actions that allow the child to do mentally what was done physically before.

Organ of corti: Structure on the surface of the basilar membrane that contains the receptor cells for hearing.

Pancreas: An important gland that secretes hormones related to the digestive process and the metabolic process. Insulin is one of the secretions of the pancreas.

Paradigm: A model or a way of approaching or studying a set of phenomena.

Parasympathetic division: Division of the autonomic nervous system (ANS) that monitors the routine operation of the body's internal functions, and returns it to calmer functioning after sympathetic arousal.

Peers: Children of about same age or the maturity level.

Perception: Processes that organise sensory information and interpret it in terms of its environmental origins.

Perceptual constancy: The ability, in perception, to draw similar inferences about the world from different patterns of sensory activity (e.g., a person seen from many different angles is still perceived as the same person).

Performance tests: Tests that do not involve language.

Phenotype: Observable features by which individuals are recognised.

Phi phenomenon: The illusion of movement created by presenting visual stimuli in rapid succession.

Phonemes: Smallest meaningful units of sound in a language.

Photoreceptor: A visual receptor; rod and cone cells.

Physiological psychology: A scientific study of human and animal behaviour based on the relationship of physiological processes like those of nervous system, hormones, sensory organs and the behavioural parameters.

Pitch: The perceptual interpretation of a sound's frequency.

Pituitary gland: Gland that secretes hormones that influence the secretions of all other endocrine glands, as well as a hormone that influences growth.

Pons: Part of the brain involved in dreaming and walking from sleep.

Positive reinforcement: A stimulus or event which, when its onset is made contingent on a particular response, increases the likelihood of that response.

Power motive: The desire to influence others, to be in charge, and to have status and prestige.

Prediction: One element of the scientific process of describing the relationship between antecedent variables and consequent events. Prediction works forward in time, beginning with measuring the antecedent variables and then anticipating the measures of the consequent events.

Prenatal period: The time from conception to birth.

Pre-operational stage: The second Piagetian stage in which children begin to represent world with words, images, and drawings but cannot perform operations in logical manner.

Primary colours: A set of three colours, i.e. red, green, and blue, when mixed in unequal amounts can produce any colour.

Primary sex characteristics: The sexual structures necessary for reproduction.

Problem solving: Behaviour that is at an advanced stage of thinking; it can be divided into four stages: incubation, illumination, preparation, and verification.

Proximity principle: The Gestalt principle, which states that objects or stimuli that are close together will be perceived as a unity. Also called law of proximity.

Proximodistal trend: The center-outward direction of motor development.

Psychoanalysis : A method of psychotherapy in which the therapist attempts to bring repressed unconscious material into conscious.

Psychological motives: Personal and interpersonal motives that lead people to strive for such ends as power, self-esteem, affiliation, and intimacy with other people.

Psychological test: A standardised measure of a sample of a person's behavior.

Psychophysics: Study of the relationship between mental processes and the physical world.

Puberty: A period of rapid skeletal and sexual maturation that occurs mainly in early adolescence.

Punishment: The application of an unpleasant, or noxious, stimulus for the purpose of suppressing behaviour.

Randomisation: A procedure by which a variable may be selected, assigned, or scheduled, in a completely unbiased manner. Randomisation involves the use of the table of random numbers so that no predictable sequence can be established.

Reasoning: Realistic thinking process that draws a conclusion from a set of facts.

Reflex arc: A receptor neuron and an efferent neuron capable of mediating a S-R sequence.

Reinforcement: An event following a response that strengthens the tendency to make that response.

Reliability: A statement about the degree of consistency of a measurement technique. Reliable techniques yield similar measures upon repeated measurement under similar conditions.

Reticular activating system (RAS): A network of fibers beginning in the spinal cord and extending up through the mid-brain into the higher centers; has a role in attention and arousal.

Retina: Layer of cells at the back of the eye containing photoreceptors.

Retrieval cues: Available internal or external stimuli that help in recovering information from storage in memory system.

Retroactive interference: Memory process in which newly learned information prevents retrieval of previously stored, similar material.

Rods: Specialised visual receptors that play a key role in night vision and peripheral vision.

Schema: A cognitive structure; a network of associations that organises and guides an individual's perceptions.

Script: A memory representation of procedural knowledge (e.g., eating in a restaurant).

Secondary sex characteristics: Physical features that are associated with gender but that are not directly involved in reproduction.

Selective attention: The focusing of conscious awareness on a particular stimulus.

Self: The individual's perception or awareness of herself or himself - of her or his body, abilities, personality traits, and ways of doing things.

Self-actualisation: It is a state of self-fulfillment in which people realise their highest potential in their own unique way.

Self-esteem: The global evaluative dimension of the self.

Semantic memory: LTM component that stores memory for basic meanings of words and concepts.

Sensation: Experience of a physical stimulation.

Sensorimotor stage: The first Piagetian stage in which infants construct an understanding of the world by coordinating sensory experiences with physical and motor actions.

Sensory adaptation: Loss of responsiveness in

receptor cells after stimulation has remained unchanged.

Sensory memory: Initial process that preserves brief impressions of stimuli, also called sensory register.

Sensory neurons: Also called afferent neurons; nerve cells that carry messages from sense receptor cells toward central nervous system.

Serial learning: The learning of a sequence of responses in the precise order of their presentation.

Sex hormones: Substances secreted by the gonads for reproductive functions and determination of secondary sex characteristics, e.g. estrogen in the female and testosterone in the male.

Shape constancy: The knowledge that even when an object is viewed from a different angle, its shape remains the same.

Similarity: The Gestalt principle, which states that objects or stimuli that are similar in shape, size or intensity, etc. are perceived as a unit.

Size constancy: A tendency to perceive familiar objects as being the same size even when they cast a different sized image on the retina because of one's distance from them.

Skeletal muscles: Muscles attached to bones, which brings about various types of body movements like the limb movements.

Socialisation: Process of social learning through which a child acquires the norms, attitudes, beliefs and behaviours that are acceptable in her/his culture; the principal agents of socialisation are the family, school, and peer group.

Sociobiology: The systematic study of the biological basis for social behaviour.

Sociology: Study of people in groups; the group rather than the individual is the unit of study.

Soma: Any kind of cell body or in general any form of body like that of humans and other animals.

Somatic nervous system: The part of the peripheral nervous system that controls voluntary muscles.

Species: A biological classification of different living organisms.

Spontaneous recovery: In classical conditioning, the reappearance of an extinguished response after a period of nonexposure to the conditioned stimulus.

Standardisation: A method of establishing norms or standards and uniform procedures for a test by administering it to a large group of representative individuals.

Stimulus: Any well-defined element in the environment affecting the organism, which may lead to an overt or a covert response.

Structuralism: Associated with Wilhelm Wundt, the approach to psychology that seeks to understand the structure and operation of consciousness, or the human mind.

Survey: A research method utilising written questionnaires or personal interviews to obtain data of a given population.

Sympathetic nervous system: The division of the autonomic nervous system that arouses the body, mobilising its energy in stressful situations.

Synapse: The junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the synaptic gap or cleft.

Synaptic vesicle: Structures in the synaptic knobs that store neurotransmitters prior to the release of neurotransmitter into the synaptic cleft.

Syntax: Refers to the rules for combining words to form acceptable phrases and sentences.

Temperament: An individual's behavioural style and characteristic way of responding.

Temporal lobe: The portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each of which receives auditory information primarily from the opposite ear.

Texture gradient: Distance cues based on the fact that objects lose definition and detail the farther away they are.

Thalamus: The brain's sensory switchboard, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla.

Thinking: The mental, or cognitive, rearrangement or manipulation of both information from the environment and of symbols stored in long-term memory. Language, symbols, concepts and images are used, and thinking is said to mediate, or go between, stimuli and responses.

Timbre: The characteristic quality of a tone produced by the combination of overtones heard along with the pure tone.

Top-down processing: In form perception, a progression from the whole to the elements.

Trace decay theory: The idea that learned material leaves in the brain a trace or impression, which eventually disappears unless it is practiced and used.

Transfer of learning: The influence of earlier learning on later learning; positive transfer enhances later learning, while negative transfer impedes it.

Traumatic experience: A injury, either physical or psychological; psychological traumas include emotional shocks that have a more or less permanent effect on the personality, such as rejection, divorce, combat, experience, civilian catastrophes, etc.

Trust vs mistrust: Erikson's first psychosocial stage; development of a sense of trust requires a feeling of physical comfort and a minimal amount of fear and apprehension about future.

Unconditioned response (UR): The unlearned or involuntary response to an unconditioned stimulus.

Unconditioned stimulus (US): A stimulus that normally produces an involuntary measurable response.

Unobtrusive measures: Observation and measurement procedures specifically selected not to interfere with the natural behaviour or enter the conscious awareness of the subject.

Validity: The ability of a test to measure what it was designed to measure.

Variable: Any measurable conditions, events, characteristics, or behaviours that are controlled or observed in a study.

Verbal learning: The process of learning to respond verbally to verbal stimuli, which may include symbols, nonsense syllables, and lists or words.

Verbal test: Test in which a subject's ability to understand and use words and concepts is important in making the required responses.

Visual illusions: Physical stimuli that consistently produce errors in perception.

Wavelength: The distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission.

Word associations: Personality assessment techniques in which individual generates responses triggered by common words.

Working memory: Memory processes that preserve recently perceived events or experiences, also called short-term memory.